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A HOST INDEX TO THE NORTH AMERICAN SPECIES OF THE GENUS CERCOSPORA

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Introduction

The genus *Cercospora* belongs to the Fungi Imperfecti, Order Moniliales (Hyphomycetes), and Family Dematiaceae. To which section of the family the genus should be referred is a point on which some difference of opinion exists. Since the spores are many times longer than broad the logical position of the genus would seem to be in the section Scolecosporae. Lindau, in Engler and Prantl's 'Die Natürlichen Pflanzenfamilien,' assigns it to this position as does Saccardo in his 'Sylloge Fungorum' **14**: 1099. 1899. However, in the earlier volumes of the 'Sylloge Fungorum' Saccardo included it in the Phragmosporae, and in this he was followed by Lindau in Rabenhorst's 'Kryptogamenflora.'

Since the published descriptions of the genus are very brief the following diagnosis is presented:

Fungi parasitic on herbaceous plant parts, especially leaves, more rarely on pedicels, stems, fruits, and bracts, usually forming definitely amphigenous necrotic spots which may become confluent and involve large areas of the leaf. Mycelium internal, filamentous, septate. Conidiophores usually emerging from the host tissue in fascicles, often by way of the stomata, usually easily visible with a hand lens, mostly hypophyllous, though frequently epiphyllous, smoky to brown in color, becoming darker with age but usually paler at the tip, simple or occasionally branched, cylindrical, wavy or geniculate with age, obtuse at the apex, usually septate when mature. Conidia borne singly and terminally on the conidiophore or becoming lateral by further

growth of the conidiophore tip, usually obclavate and attached by the broader base, often considerably attenuated at the apex, many times longer than broad, subhyaline to brown, or rarely entirely hyaline, smooth, at first aseptate, later becoming several- to many-septate, the usual range in length varying between 30 and 150 μ, with an average width of 3 to 6 μ, straight or curved.

The species of the genus *Cercospora* are usually typical leaf-spotting fungi. Under the hand-lens the conidiophores are usually visible as dark-colored tufts of projecting hyphae. In some cases they are too short to be individually recognizable under the lens and the tuft may appear as a very small projecting pustule. The color of the conidiophores and conidia is dark by reflected light, and this point usually enables one to distinguish this fungus from species of *Ramularia*, in which the spores and conidiophores are paler and appear whitish under the lens. Under the microscope, and especially in cross-sections of the leaf, these conidiophores are often seen to be confluent at their bases in a sub-stromatic or tubercular mass that, in many cases at least, is located in the sub-stomatal vesicle of the host plant. Emerging from the host, the conidiophores in the individual tufts may stand almost erect in the fascicle; in other cases they diverge at varying angles; and at times they become almost decumbent. When the conidiophores are erect they may be so closely bound together that the fascicle simulates a coremium such as present in *Isariopsis*.

The mode of formation of the conidia is such that while young conidiophores may be almost straight and smooth-walled, the older ones are likely to become wavy or irregular in outline. The first conidium is produced at the tip of a conidiophore. Then by further growth from a point near the place of attachment of this conidium the tip continues, usually at a slight angle to the direction of its previous growth, and then produces another conidium. This process may be repeated several times. Sometimes the direction of secondary growth is almost at right angles to that of the main axis of the conidiophore, in which case the tip of the conidiophore is sharply bent. The point of attachment of each conidium is usually visible after the conidium has fallen, so that the number of conidia that any conidiophore has pro-

duced can be rather easily determined. It follows then that the older conidiophores may present quite a different appearance from those that are producing their first crop of conidia. This is also correlated with a deepening in color, so that the older conidiophores are both more irregular and darker than are the younger ones. This point should be borne in mind in determining specific limitations.

As in the case of all fungi with septate and elongated spores, the growth of the conidium and the formation of the septae is a continuous process, so that young spores may be much shorter and lack septae or have a lesser number of septae than do mature spores of the same species. Because of this fact, undoubtedly many species that have been recognized as distinct from others on the basis of smaller conidia with fewer septae are in reality only immature forms of other species.

History

The early use of the name *Cercospora* is difficult to follow, notwithstanding the fact that it was not proposed until 1863. In that year Fuckel issued his exsiccati entitled 'Fungi Rhenani,' of which numbers 117 to 120 are species of *Cercospora* and are so designated. The characterization "Cercospora Fres. Passalora valde affinis est, sed constanter sporidiis multiseptatis differt." (No. 117) probably satisfies the requirements of generic diagnosis according to the International Code. In the same year (1863) Fresenius published his 'Beiträge zur Mykologie,' in which (pp. 91–93) he fails to give a formal description of *Cercospora* but refers to it and describes *C. Apii*, *C. Chenopodii*, *C. penicillata*, and *C. ferruginea*, some of which he had apparently received from Fuckel, to whom he attributes the last-named species. Fresenius remarks that the specimens sent by Fuckel could not be classified with previously described genera because of the elongated conidia (p. 92, under *C. Apii*). The characters on which he recognized these species as constituting a generic entity are not succinctly stated, yet enough is given for the recognition of the group. It would appear that Fuckel's 'Fungi Rhenani' was issued almost simultaneously with Fresenius' 'Beiträge zur Mykologie' but it is probably not possible

to decide which actually appeared first. Under the circumstances *C. Apii* Fres. would seem to be the type species of the genus.

Fresenius delimits the genus *Cercospora* on the following characters which we find mentioned in the notes and in the description of the type species, *C. Apii:* brown conidiophores borne in fascicles, simple, erect or nearly so, bearing hyaline bristle-like spores. The conidiophores are non-septate or sometimes show a cross-wall above the base. At their apices and along the sides there are dark scars from fallen conidia. The spores are bristle-like with clavate thickened bases and gradually attenuated apices; they are erect or bent in various ways at the apex. The septations in the conidia vary from three to eleven.

All of the members of the genus *Cercospora* described in Fresenius' 'Beiträge zur Mykologie' agree in having brown conidiophores but the color of the conidia themselves as there described varies from hyaline (*C. Apii*) to brown (*C. ferruginea*). The shape of both spores and conidiophores varies little. If the spores of *C. Apii*[1] are in reality hyaline, and that species be taken as the type of the genus, then it becomes impossible to limit the genus *Cercospora* to brown-spored species.

Saccardo, in Michelia **2**: 20. 1880, described the genus *Cercosporella* which may be regarded, in part at least, as a segregate from *Cercospora.* The first two species mentioned by him are *Cercosporella persica* Sacc. and *C. cana* Sacc., both of which had been previously described by him under the genus *Cercospora.* The separation into the new genus *Cercosporella* was made on the basis of the presence in these species of hyaline conidiophores and conidia. This genus has been commonly accepted, and to it have been transferred a considerable number of hyaline-spored species of *Cercospora.* However, a great deal of work yet remains to be done before the exact status of many species now under *Cercospora* can be determined.

As stated above, the genus *Cercospora* as originally proposed by Fresenius, in 1863, contained four species there described for the first time. Fuckel in his 'Symbolae Mycologici,' 1869–70,

[1] The spores vary from hyaline to brown according to reports. Stevens describes them as hyaline; Schwarze hyaline to brown.

enumerated 10 species. Saccardo, in Michelia, 1877–1882, described approximately 60 species. Cooke in Grevillea, 1876–1885, has described some 37 additional species. Since then, Ellis and his co-workers have described more than 150 American species. This number has been augmented by various workers, such as Peck who has described at least 30 species, Atkinson with 40 or more, Kellerman and Swingle with 7 or 8, Tehon and Daniels with approximately a dozen, Tharp with 30 or more, and Heald and Wolf with 20 or more.

Nomenclature and Citations

In working out the nomenclature of the host species an attempt has been made to follow the International Code as exemplified in Gray's 'New Manual of Botany,' 7th edition, and Bailey's 'Manual of Cultivated Plants,' except in such cases where it has seemed more expedient to follow volumes 1 and 2 of the 'Index Kewensis.' For the nomenclature of the species of the genus *Cercospora* the International Code has been used throughout.

In several cases quotations concerning the relationships of the species have been introduced. Unless these are specifically attributed to a particular author, they are always the comments of the original author of the species.

It has been thought worth while to give with each species such additional references as might be of service in confirming an identification reached by means of the host index. Therefore in citing the literature of *Cercospora* the first citation is to the original place of publication of the binomial in question. If another citation intervenes between this and the citation in 'Sylloge Fungorum,' provided that the *Cercospora* was described previous to the appearance of volume 22, it constitutes the original description of the fungus under another name. The 'Sylloge Fungorum' reference appears next, followed by whatever other descriptions may have been found in looking over available literature. For most species the next most important reference is Ellis and Everhart's 'Enumeration of the North American Cercosporae' which began in the first number of the Journal of Mycology (1885) and was continued through volume 4 (1888). The work was not intended as a monograph, but simply a compila-

tion of species known at that time. Because they contain descriptions of a considerable number of species, the articles by Atkinson (Jour. Elisha Mitchell Sci. Soc. 8: 33–67. 1892) and by Schwarze (N. J. Agr. Sta. Bull. 313. 1917) are consistently cited for the species they contain. Wherever the United States Department of Agriculture Bulletin 1366 or the 'Scientific Survey of Porto Rico' is mentioned, it should be borne in mind that these are merely lists of hosts and their attacking fungi and contain no descriptive matter. Similarly, the Transactions of the Wisconsin Academy of Sciences, Arts, and Letters is frequently cited, when no description is given, because a new host is listed or the geographical range is extended.

The Scope and Arrangement of the Index

Only those plants indigenous to the continent of North America which are hosts to *Cercospora* are cited. An attempt has been made to list the International Code name; synonyms appear in italics and their equivalents follow in ordinary type. In the "Host Index" the hosts included in a bracket are affected by the same species of *Cercospora*. In the "Index of Species of Cercospora" where literature citations are given, each species is preceded by a number. This number appears again as a cross-reference in "Host Families and their Cercosporas" where the Cercosporas are arranged according to the host families they affect.

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Abbreviations of Authors

Herewith is appended a list of the abbreviations for the names of authors, and for titles of publications cited:

Allesch.	= Allescher, A.
Atk.	= Atkinson, G. F.
Barth.	= Bartholomew, E. T.
Berk.	= Berkeley, M. J.
Berl.	= Berlese, A. M.
Br.	= Broome, C. E.
Bres.	= Bresadola, G.
Casp.	= Caspary, R.
Ces.	= Cesati, V.
Clint.	= Clinton, G. P.
Curt.	= Curtis, M. A.
Dearn.	= Dearness, J.
Desm.	= Desmazieres, J.
Ell.	= Ellis, J. B.
Ev.	= Everhart, B. M.
Fckl.	= Fuckel, L.
Fres.	= Fresenius, G.
Gall.	= Galloway, B. T.
Ger.	= Gerard, W. R.
Halst.	= Halsted, B. D.
Harkn.	= Harkness, H. W.
Henn.	= Hennings, P.
Holw.	= Holway, E.
Kell.	= Kellerman, W.
Langl.	= Langlois, L. B.
Lév.	= Léveillé, J. H.
Mart.	= Martin, G.
Massal.	= Massalongo, C.
Oud.	= Oudemans, C. A.
Pass.	= Passerini, G.
Pat.	= Patouillard, N.
Penz.	= Penzig, O.
Rab.	= Rabenhorst, L.
Racib.	= Raciborski, M.
Rav.	= Ravenel, H. W.
Roum.	= Roumeguere, C.
Sacc.	= Saccardo, P. A.
Sacc.D.	= Saccardo, D.
Schn.	= ? Schneider, W. G.
Sorok.	= Sorokin, N.
Speg.	= Spegazzini, C.
Sw.	= Swingle, W.
Sydow	= Sydow, H. & P.
Thuem.	= de Thuemen, F.
Westd.	= Westendorp, G. D.
Wint.	= Winter, G.

Abbreviations of Publications

Acad. Phila. Proc.	= Proceedings of the Academy of Natural Sciences of Philadelphia.
Acad. Roy. Sci. Belgique Bull.	= Bulletins de l'Academie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique.
Ala. Agr. Sta. Bull.	= Alabama Agricultural Experiment Station Bulletin.
Am. Nat.	= The American Naturalist.
Ann. Mag. Nat. Hist.	= Annals and Magazine of Natural History.
Ann. Myc.	= Annales Mycologici.
Ann. Sci. Nat. Bot.	= Annales des Sciences Naturelles. Botanique.
B. P. I. Bull.	= United States Department of Agriculture—Bureau of Plant Industry Bulletin.
Beitr. Myk.	= Beiträge zur Mykologie.
Bot. Gaz.	= Botanical Gazette.
Bot. Univ. Pavia Atti	= Atti dell' Istituto Botanico dell' Universita di Pavia.
Calif. Acad. Sci. Bull.	= California Academy of Sciences Bulletin.
Can. Inst. Proc.	= Proceedings of the Canadian Institute.
Can. Inst. Trans.	= Transactions of the Canadian Institute.

Can. Rec. Sci.	= Canadian Record of Science.
Cornell Univ. Bull.	= Bulletin of Cornell University.
Dec. Myc.	= Decades Mycologicae Italicae.
Elisha Mitchell Sci. Soc. Jour.	= Journal of the Elisha Mitchell Scientific Society.
Field Mus. Bot. Ser. Rept.	= Field Columbian Museum Report—Botanical Series.
Fla. Agr. Sta. Bull.	= Florida Agricultural Experiment Station Bulletin.
Fungi Columb.	= Fungi Columbiana.
Grev.	= Grevillea.
Guar.	= Fungi Guarantici.
Harriman Alaska Exped.	= Harriman Alaska Expedition.
Hedw.	= Hedwigia.
Ill. Acad. Trans.	= Transactions of the Illinois Academy of Science.
Ind. Acad. Proc.	= Proceedings of the Indiana Academy of Science.
Iowa Acad. Proc.	= Proceedings of the Iowa Academy of Science.
Ist. Veneto Atti	= Atti R. Istituto Veneto di Scienze, Lettere ed Arti.
Jour. Myc.	= Journal of Mycology.
K. Akad. Wiss. Berlin Monatsber.	= Monatsberichte der Königlichen Akademie der Wissenschaft Berlin.
Linn. Soc. Bot. Jour.	= Journal of Linnaean Society—Botany. London.
Mededeel. Proefst. Suiker.	= Mededeelingen van het Proefstation voor de Java Suikerindustrie.
Mich. Agr. Sta. Tech. Bull.	= Michigan Agricultural Experiment Station Technical Bulletin.
Misc. myc.	= Miscellanea mycologica.
Mo. Bot. Gard. Ann.	= Annals of the Missouri Botanical Garden.
Myc.	= Mycologia.
Myc. Univ.	= Mycotheca Universalis.
Myc. Ven.	= Mycotheca Veneta.
Not. Myc.	= Notae Mycologicae.
N. J. Agr. Sta. Bull.	= New Jersey Agricultural Experiment Station Bulletin.
Nuovo Giorn. Bot. Ital.	= Nuovo Giornale Botanico Italiano.
N. Y. Acad. Ann.	= Annals of the New York Academy of Sciences.
N. Y. Bot. Gard. Bull.	= New York Botanical Garden Bulletin.
N. Y. Mus. Rept.	= State Museum Report—University of the State of New York.
Oest. Bot. Zeitschr.	= Oesterreichische botanische Zeitschrift.
Phytopath.	= Phytopathology.
Rev. Myc.	= Revue Mycologique.
Sci. Surv. Porto Rico	= Scientific Survey of Porto Rico and the Virgin Islands.
Soc. Cien. Argent. Ann.	= Annales de la Sociedad Cientifiques Argentina.

Soc. Myc. Fr. Bull.	= Bulletin de la Société Mycologique de France.
Syll. Fung.	= Sylloge Fungorum.
Symb. Myc.	= Symbolae Mycologicae.
Tex. Agr. Sta. Bull.	= Texas Agricultural Experiment Station Bulletin.
Tokyo Coll. Agr. Jour.	= Journal of the College of Agriculture, Imperial University of Tokyo.
Torr. Bot. Club Bull.	= Bulletin of the Torrey Botanical Club.
Tuskegee Sta. Bull.	= Tuskegee Experiment Station Bulletin.
Wisc. Acad. Trans.	= Transactions of the Wisconsin Academy of Sciences, Arts, and Letters.
Univ. Maine Studies	= University of Maine Studies.
U. S. D. A. Bull.	= United States Department of Agriculture Bulletin.
Zeit. Pflanzenkr.	= Zeitschrift für Pflanzenkrankheiten.

Host Index

Abelmoschus esculentus (L.) Moench = Hibiscus esculentus L.
Abutilon Avicennae Gaertn. = A. Theophrasti Medic.
Abutilon Theophrasti Medic.
  C. Abutilonis Tehon & Daniels
  C. Althaeina Sacc.
Acalypha caroliniana Ell. = A. ostryaefolia Ridd.
Acalypha graciliens Gray
  C. Acalyphae Peck
Acalypha ostryaefolia Ridd.
  C. Acalyphae Peck
  C. Acalypharum Tharp
Acalypha virginica L.
  C. Acalyphae Peck
Acer Negundo L.
  C. Negundinis Ell. & Ev.
Acerates viridiflora (Raf.) Eaton
  C. Briareus Ell. & Ev.
Achyranthes portoricensis (Kuntze) Standl.
  C. Alternantherae Ell. & Langl.
Acnida cannabina L.
  C. Acnidae Ell. & Ev.
Actinomeris alternifolia (L.) DC.
  C. anomala Ell. & Halst.
Actinomeris squarrosa Nutt. = A. alternifolia (L.) DC.
Acuan illinoense (Michx.) Kuntze = Desmanthus illinoensis (Michx.) Mac M.
Aesculus octandra Marsh
  C. Aesculina Ell. & Kell.
Agrostis sp.
  C. Agrostidis Atk.
Ailanthus glandulosa Desf.
  C. glandulosa Ell. & Kell.
Alisma Plantago-aquatica L. ex Am. Auth.
  C. Alismatis Ell. & Holw.
  C. pachyspora Ell. & Ev.
Alisma subcordatum Raf. = A. Plantago-aquatica L.
Allionia hirsuta Pursh = Oxybaphus hirsutus (Pursh) Sweet
Allionia nyctaginea Michx. = Oxybaphus nyctagineus (Michx.) Sweet
Alternanthera Achyrantha R. Br.,
Alternanthera portoricensis (Kuntze) Standl.
  C. Alternantherae Ell. & Langl.
Althaea rosea Cav.
  C. Althaeina Sacc.
  C. Kellermani Bubák
Amaranthus sp.
  C. brachiata Ell. & Ev.
  C. canescens Ell. & Mart.
Amaranthus retroflexus L.
Amaranthus spinosus L.
  C. brachiata Ell. & Ev.
Amaryllis sp.
  C. Amaryllidis Ell. & Ev.

Ambrosia trifida L.
C. Arcti-Ambrosiae Halst.
C. racemosa Ell. & Mart.
Amelanchier sp.
C. Mali Ell. & Ev.
Ammania coccinea Rottb.
C. Ammanniae Tharp
Ammania latifolia Torr. & Gray, not L. = A. coccinea Rottb.
Amorpha canescens Pursh
C. Passaloroides Wint.
Amorpha cordata
C. Vitis (Lév.) Sacc.
Amorpha fruticosa L.
C. Passaloroides Wint.
Ampelopsis sp.
C. Ampelopsidis Peck
Ampelopsis arborea (L.) Rusby = Cissus arborea (L.) DesMoulins
Ampelopsis cordata Michx. = Cissus Ampelopsis Pers.
Ampelopsis quinquefolia (L.) Michx. = Psedera quinquefolia (L.) Greene
Amphicarpaea comosa Nwd. & Lunell
C. simulans Ell. & Kell.
Amphicarpa monoica (L.) Ell.
C. monoica Ell. & Holw.
C. simulans Ell. & Kell.
Amygdalus spp. = Prunus spp.
Andropogon halepensis (L.) Brot. = Holcus halepensis L.
Anethum graveolens L.
C. Anethi Sacc.
Angelica ?
C. Apii Fres. var. *Angelicae* Sacc. & Scalia
Angelica hirsuta Muhl. = A. villosa (Walt.) BSP.
Angelica villosa (Walt.) BSP.
C. Thaspii Ell. & Ev.
Apios tuberosa Moench
C. tuberosa Ell. & Kell.
Apium graveolens L.
C. Apii Fres.
Apocynum sp.
C. Apocyni Ell. & Kell.
Aquilegia canadensis L.
C. Aquilegiae Kell. & Sw.
Arachis hypogaea L.
C. personata (Berk. & Curt.) Ell.
Aralia nudicaulis L.
C. leptosperma Peck
Aralia spinosa L.
C. atromaculans Ell. & Ev.
Archangelica hirsuta Torr. & Gray = Angelica villosa (Walt.) BSP.
Arctium Lappa L.
C. Arcti-Ambrosiae Halst.
Arctostaphylos Uva-ursi (L.) Spreng.
C. Arctostaphyli Davis
Argythamnia mercurialina Muell.
C. Argythamniae Dearn. & House
Aristolochia macrophylla Lam.
C. guttulata Ell. & Kell.
Aristolochia Serpentaria L.
C. Serpentariae Ell. & Ev.
Armoracia rusticana Gaertn. Mey. & Scherb.
C. Armoraciae Sacc.
Aronia arbutifolia (L.) Ell. = Pyrus arbutifolia (L.) L. f.
$\left\{\begin{array}{l}\text{Artemisia Absinthium L.}\\\text{Artemisia ludoviciana Nutt.}\end{array}\right.$
C. Absinthii (Peck) Sacc.
Artemisia vulgaris L.
C. ferruginea Fckl.
Arundinaria tecta (Walt.) Muhl.
C. Scolecotrichoides Atk.
Asclepias amplexicaulis J. E. Smith
C. clavata (Ger.) Peck
Asclepias cordifolia (Benth.) Jep. = Gomphocarpus cordifolius Benth.
Asclepias Cornuti Decne. = A. syriaca L.
Asclepias curassavica L.
C. venturioides Peck
Asclepias ecornuta Kell. = Gomphocarpus cordifolius Benth.
Asclepias incarnata L.
C. clavata (Ger.) Peck
C. incarnata Ell. & Ev.
Asclepias Jamesii Torr. & Gray = A. latifolia (Torr.) Raf.
Asclepias latifolia (Torr.) Raf.
C. Asclepiodorae Ell. & Kell.
Asclepias Meadii Torr.
C. clavata (Ger.) Peck

Asclepias obtusifolia Michx. = A. amplexicaulis J. E. Smith
{Asclepias phytolaccoides Pursh
{Asclepias speciosa Torr.
C. *clavata* (Ger.) Peck
Asclepias syriaca L.
C. *clavata* (Ger.) Peck
C. *elaeochroma* Sacc.
C. *Hanseni* Ell. & Ev.
C. *illinoensis* Barth.
C. *venturioides* Peck
{Asclepias tuberosa L.
{Asclepiodora sessilis
{Asclepiodora viridis (Walt.) Gray
C. *Asclepiodorae* Ell. & Kell.
Asimina triloba Dunal
C. *Asiminae* Ell. & Kell.
Asparagus officinalis L.
C. *Asparagi* Sacc.
C. *caulicola* Wint.
Aster sp.
C. *Asterata* Atk.
C. *viminei* Tehon
Aster vimineus Lam.
C. *viminei* Tehon
Atriplex patula L.
C. *dubia* (Riess) Wint.
Baccharis Douglasii DC.
C. *Baccharidis* Ell. & Ev.
{Baptisia sp.
{Baptisia bracteata (Muhl.) Ell.
{Baptisia leucantha Torr. & Gray
C. *velutina* Ell. & Kell.
Begonia sp.
C. sp.—reported in Tex. Agr. Sta. Bull. **9**: 24. 1890, Jour. Myc. **6**: 83. 1891, and in U. S. D. A. Bull. 1366. 1926, without description.
Beta vulgaris L.
C. *beticola* Sacc.
Bidens sp.
C. *umbrata* Ell. & Holw.
{Bidens cernua L.
{Bidens connata Muhl.
C. *megalopotamica* Speg.
Bidens Nashii Small
C. *Bidentis* Tharp
Bignonia capreolata L.
C. *capreolata* Ell. & Ev.
Bignonia crucigera L., in part = B. capreolata L.
Bignonia radicans L. = Campsis radicans (L.) Seem.
Blitum capitatum L. = Chenopodium capitatum (L.) Asch.
Boehmeria cylindrica (L.) Sw.
C. *Boehmeriae* Peck
Borreria micrantha Torr. & Gray
C. *Borreriae* Ell. & Ev.
Brassica oleracea capitata L.
C. *Bloxami* Berk. & Br.
Breweria humistrata (Walt.) Gray
C. *Stylismae* Tracy & Earle
Brickellia californica (Kuntze) Gray
C. *Coleosanthi* Ell. & Ev.
Buchloë dactyloides (Nutt.) Engelm.
C. *seminalis* Ell. & Ev.
Bumelia lanuginosa (Michx.) Pers.
C. *lanuginosa* Heald & Wolf
Calla palustris L.
C. *Callae* Peck & Clint.
{Callicarpa sp.
{Callicarpa americana L.
C. *Callicarpae* Cooke
{Callirhoë sp.
{Callirhoë involucrata (Torr. & Gray) Gray
C. *Althaeina* Sacc.
Callirhoë triangulata (Leavenw.) Gray
C. *Althaeina* Sacc. var. *praecincta* Davis
Campsis radicans (L.) Seem.
C. *duplicata* Ell. & Ev.
C. *Langloisii* Sacc.
C. *sordida* Sacc.
Camptosorus rhizophyllus (L.) Link
C. *Camptosori* Davis
Capsicum annuum L. = C. frutescens L.
Capsicum frutescens L.
C. *Capsici* Heald & Wolf
Carduus altissimus L. = Cirsium altissimum (L.) Spreng.
{Carex arctata Boott
{Carex castanea Wahlenb.
{Carex cephaloidea Dewey
C. *Caricina* Ell. & Dearn.
Carex folliculata L.
C. *Caricis* Dearn. & House

Carex gracillima Schwein.
Carex grisea Wahlenb.
Carex intumescens Rudge
C. Caricina Ell. & Dearn.
Carex laxiflora Lam.
C. microstigma Sacc.
Carex lupulina Muhl.
Carex retrorsa Schwein.
Carex rosea Schkuhr.
C. Caricina Ell. & Dearn.
Carum Petroselinum Benth. & Hook. = Petroselinum hortense Hoff.
Carya alba (L.) K. Koch
C. Halstedii Ell. & Ev.
Carya illinoensis (Wang.) K. Koch
C. fusca (Heald & Wolf) emend. F. V. Rand, acc. to U. S. D. A. Bull. 1366. 1926.
Carya olivaeformis Nutt. = C. illinoensis (Wang.) K. Koch
Carya tomentosa Nutt. = C. alba (L.) K. Koch
Casimiroa edulis La Llave
C. Coleroides Sacc.
Cassava sp.
C. Cassavae Ell. & Ev.
Cassia alata L.
C. Chamaecristae Ell. & Kell.
C. simulata Ell. & Ev.
Cassia Chamaecrista L.
C. Chamaecristae Ell. & Kell.
Cassia marilandica L.
C. simulata Ell. & Ev.
Cassia nictitans L.
C. pinnulaecola Atk.
Cassia obtusifolia L. = C. Tora L.
Cassia occidentalis L.
C. Chamaecristae Ell. & Kell.
C. occidentalis Cooke
C. personata (Berk. & Curt.) Ell. & Ev. var. *Cassiae occidentalis* Sacc.
Cassia Tora L.
C. atromaculans Ell. & Ev.
C. nigricans Cooke
C. Torae Tharp
Castalia odorata (Ait.) Woodville & Wood
Castalia tuberosa (Paine) Greene
C. Nymphaeacea Cooke & Ell.
Castilleja pallida Kunth
C. sp. acc. to Iowa Acad. Proc. **27**: 105. 1920.
Catalpa bignonioides Walt.
C. Catalpae Wint.
Catalpa Catalpa Karst. = C. bignonioides Walt.
Catalpa speciosa Warder
C. Catalpae Wint.
Cathartolinum virginianum (L.) Reichenb. = Linum virginianum L.
Caulophyllum thalictroides (L.) Michx.
C. Caulophylli Peck
Ceanothus americanus L.
C. Ceanothi Kell. & Sw.
Ceanothus arboreus Greene
C. MacClatchieana Sacc. & Syd.
Ceanothus ovatus Desf.
C. Ceanothi Kell. & Sw.
Cebatha carolina (L.) Britt. = Coccolus carolinus (L.) DC.
Celastrus scandens L.
C. melanochaeta Ell. & Ev.
Cephalanthus occidentalis L.
C. Cephalanthi Ell. & Kell.
C. perniciosa Heald & Wolf
Cercis canadensis L.
C. cercidicola Ell.
C. cercidicola Ell. var. *coremioides* Tehon
Cercis occidentalis Torr.
C. cercidicola Ell.
Chaetochloa glauca (L.) Scribn. = Setaria glauca (L.) Beauv.
Chamaecrista nictitans (L.) Moench = Cassia nictitans L.
Chayota edulis Jacq. = Sechium edule (Jacq.) Sw.
Chenopodium album L.
C. dubia (Riess) Wint.
Chenopodium ambrosioides L. var. anthelminthicum (L.) Gray
C. anthelmintica Atk.
Chenopodium capitatum (L.) Asch.
C. dubia (Riess) Wint.
Chionanthus virginica L.
C. Chionanthi Ell. & Ev.
Chloris petraea Sw.
Chloris Swartziana Doell.
C. caespitosa Ell. & Ev.

Chrysanthemum sp.
C. Chrysanthemi Heald & Wolf
Chrysobalanus oblongifolius Michx.
C. Chrysobalani Ell. & Ev.
Chrysopsis graminifolia (Michx.) Nutt.
C. macroguttata Atk.
Cichorium Intybus L.
C. Cichorii Davis
Cinchona sp.
C. Cinchonae Ell. & Ev.
Cirsium sp.
C. kansensis Syd.
C. obesa Ell. & Ev.
Cirsium altissimum (L.) Spreng.
C. kansensis Syd.
Cirsium remotifolium (Gray) Jeps.
C. Cirsii Ell. & Ev.
Cirsium undulatum (Nutt.) Spreng.
C. ditissima Ell. & Ev.
Cissus Ampelopsis Pers.
C. truncata Ell. & Ev.
Cissus arborea (L.) DesMoulins
C. arboriae Tharp
Citrullus Citrullus (L.) Small = C. vulgaris Schrad.
Citrullus vulgaris Schrad.
C. Citrullina Cooke
Citrus Aurantium L.
C. aurantia Heald & Wolf
Citrus sinensis Pers. = C. Aurantium L.
Clematis sp.
C. rubigo Cooke & Harkn.
{Clematis viorna L.
{Clematis virginiana L.
C. squalidula Peck
Cleome sp.
C. conspicua Earle
Cleome pungens Willd. = C. spinosa L.
Cleome spinosa L.
C. Cleomis Ell. & Halst.
C. conspicua Earle
{Clitoria mariana L.
{Clitoria virginiana L.
C. Clitoriae Atk.
Cnicus sp. = Cirsium sp.
Cnicus remotifolius Gray = Cirsium remotifolium (Gray) Jeps.
Cnicus undulatus (Nutt.) Gray = Cirsium undulatum (Nutt.) Spreng.
Coccolus carolinus (L.) DC.
C. Menispermi Ell. & Holw.
Coffea arabica L.
C. coffeicola Berk. & Curt.
C. Herrerana Farneti
Coleosanthus californicus Kuntze = Brickellia californica (Kuntze) Gray
Comandra umbellata (L.) Nutt.
C. Comandrae Ell. & Dearn.
Comarum palustre L. = Potentilla palustris (L.) Scop.
Convolvulus acetosaefolius R. & S. = Ipomoea stolonifera (Cyrill.) Poir.
Convolvulus sepium L.
C. tuberculella Davis
Cornus femina Mill.
C. Corni Davis
Cornus florida L.
C. cornicola Tracy & Earle
Cornus paniculata L'Her.
C. Corni Davis
Cracca hispidula (Michx.) Kuntze = Tephrosia hispidula (Michx.) Pers.
Crassina elegans (Jacq.) Kuntze = Zinnia elegans Jacq.
Crataegus sp.
C. confluens Lieneman, nom. nov.
Crataegus apiifolia Michx. = C. Marshallii Eggl.
Crataegus Marshallii Eggl.
C. Apiifoliae Tharp
Crinum sp.
C. Pancratii Ell. & Ev.
Crotalaria sagittalis L.
C. Demetrioniana Wint.
Croton sp.
C. Crotonis Ell. & Ev.
Croton capitatus Michx.
C. capitati Tharp
Croton fruticulosus Engelm.
C. crotonicola Ell. & Barth.
Croton glandulosus L.
C. crotonifolia Cooke
Croton maritimus Walt.
C. maritima Tracy & Earle
Croton texensis (Klotzsch) Muell. Arg.
C. Crotonis Ell. & Ev.
Cubelium concolor (Forst.) Raf. = Hybanthus concolor (Forst.) Spreng.

Cucumis sativus L.
C. sp.—cited in U. S. D. A. Bull. 1366. 1926.

Cucurbita sp.
C. cucurbitacea Ell. & Gall., acc. to U. S. D. A. Bull. 1366. 1926.

Cucurbita foetidissima HBK.
Cucurbita Lagenaria L.
Cucurbita maxima Duchesne
Cucurbita moschata Duchesne
Cucurbita Pepo L.
C. Cucurbitae Ell. & Ev.

Cucurbita perennis Gray = C. foetidissima HBK.

Cydonia japonica Pers. = Pyrus japonica (Pers.) Thunb.

Cynara Cardunculus L.
Cynara Scolymus L.
C. obscura Heald & Wolf

Cynoctonum Mitreola (L.) Britt.
C. torta Tracy & Earle

Cynoctonum petiolatum (Walt.) Gmel. = C. Mitreola (L.) Britt.

Cynoxylon floridum (L.) Raf. = Cornus florida L.

Cyperus filiculmis Vahl
Cyperus Houghtonii Torr.
Cyperus Schweinitzii Torr.
C. Caricina Ell. & Dearn.

Cypripedium acaule Ait.
Cypripedium hirsutum Mill.
Cypripedium parviflorum Salisb. var. pubescens (Willd.) Knight
C. Cypripedii Ell. & Dearn.

Cypripedium spectabile Salisb. = C. hirsutum Mill.

Dactyloctenium aegyptium (L.) Richter
C. tessellata Atk.

Dalea enneandra Nutt.
C. Daleae Ell. & Kell.

Dalea laxiflora Pursh = D. enneandra Nutt.

Dasystephana linearis (Froel.) Britt. = Gentiana linearis Froel.

Dasystoma virginica (L.) Britt. = Gerardia virginica (L.) BSP.

Datura Metel L.
C. crassa Sacc.

Datura Stramonium L.
C. crassa Sacc.
C. Daturae Peck

Daucus Carota L.
C. sp.—mentioned in U. S. D. A. Bull. 1366. 1926.

Decodon verticillatus (L.) Ell.
C. Decodontis Tehon & Daniels
C. Nesaeae Ell. & Ev.

Decumaria barbara L.
C. Decumariae Tracy & Earle

Desmanthus illinoensis (Michx.) MacM.
C. Desmanthi Ell. & Kell.

Desmodium acuminatum DC. = D. grandiflorum (Walt.) DC.

Desmodium grandiflorum (Walt.) DC.
Desmodium molle DC.
Desmodium nudiflorum (L.) DC.
C. Desmodii Ell. & Kell.

Desmodium tortuosum DC.
C. melaleuca Ell. & Ev.

Deutzia gracilis Sieb. & Zucc.
C. Deutziae Ell. & Ev.

Dianthera americana L.
C. Diantherae Ell. & Kell.

Diervilla sp.
C. Weigeliae Ell. & Ev.

Diervilla Lonicera Mill.
C. Diervillae Ell. & Ev.

Diervilla trifida Moench = D. Lonicera Mill.

Diodia teres Walt.
C. Diodiae Cooke

Diodia virginiana L.
C. Diodiae-virginianae Atk.

Dioscorea villosa L.
C. Dioscoreae Ell. & Mart.
C. nubilosa Ell. & Ev.

Diospyros Kaki L.
C. Diospyri Thuem.
C. fuliginosa Ell. & Kell.
C. Kaki Ell. & Ev.

Diospyros virginiana L.
C. atra Ell. & Ev.
C. Diospyri Thuem.
C. Diospyri Thuem. var. *ferruginosa* Atk.
C. flexuosa Tracy & Earle

C. fuliginosa Ell. & Kell.
C. virginiana Thuem.—cited in U. S. D. A. Bull. 1366. 1926.
Dipsacus sylvestris Huds.
C. elongata Peck
Dipteracanthus ciliosus Nees. = Ruellia parviflora (Nees) Britt.
Ditremexa occidentalis (L.) Britt. & Rose = Cassia occidentalis L.
Dolichos sp.
C. cruenta Sacc.
Dolichos Lablab L.
C. canescens Ell. & Mart.
Dolichos sinensis L. = Vigna sinensis (L.) Endl.
Echinochloa crusgalli (L.) Beauv.
C. Echinochloae Davis
Echinocystis lobata (Michx.) Torr. & Gray
C. Echinocystis Ell. & Mart.
Eichhornia speciosa Kunth
C. Piaropi Tharp
Elaeagnus sp.
Elaeagnus angustifolia L.
C. Elaeagni Heald & Wolf
Elephantopus carolinianus Willd.
C. Elephantopodis Ell. & Ev.
Elephantopus caroliniensis G. F. W. Mey.[1]
Elephantopus nudatus Gray
Elephantopus tomentosus L.
C. Elephantopodis Ell. & Ev.
Eleusine aegyptia Pers. = Dactyloctenium aegyptium (L.) Richter
Epigaea repens L.
C. Epigaeae Ell. & Dearn.
C. Epigaeina Davis
Epilobium adenocaulon Haussk.
C. montana (Speg.) Sacc.
Epilobium alpinum L.
C. Epilobii Schn.
Epilobium angustifolium L.
Epilobium coloratum Muhl.
C. montana (Speg.) Sacc.
Erechthites hieracifolia (L.) Raf.
C. Erechthitis Atk.
Erechthites praealta Raf. = E. hieracifolia (L.) Raf.
Erigeron annuus (L.) Pers.
C. grisella Peck
Erigeron tomentosus[2]
C. ferruginea Fckl.
Eriogonum molle Greene
C. Eriogoni Ell. & Ev.
Eriogonum tomentosum Michx.
C. rubella Cooke
Erysimum cheiranthoides L.
C. Erysimi Davis
Erysimum officinale (L.) Scop. = Sisymbrium officinale Scop.
Erythrina Crista-galli L.
C. Erythrinae Ell. & Ev.
Erythrina herbacea L.
C. erythrinicola Tharp
Euonymus americana L.
Euonymus atropurpurea Jacq.
Euonymus europaea L.
C. Euonymi Ell.
Euonymus japonica L.
C. destructiva Rav.
Eupatorium ageratoides L. = E. urticaefolium Reichard
Eupatorium album L.
C. Ageratoides Ell. & Ev.
C. Eupatorii Peck
Eupatorium perfoliatum L.
Eupatorium purpureum L.
C. perfoliata Ell. & Ev.
Eupatorium rotundifolium L.
C. Eupatorii Peck
Eupatorium urticaefolium Reichard
C. Ageratoides Ell. & Ev.
Eupatorium verbenaefolium Michx.
C. Agrostidis Atk.

[1] Although *C. Elephantopodis* was described in the original as occurring on *Elephantopus carolinensis*, a tropical species, the host is more likely to have been *Elephantopus carolinianus* Willd.

[2] Search through the available literature has failed to disclose this species of *Erigeron* as cited by Ellis and Everhart. Perhaps *Erigeron tomentosus* was an error for *Eriogonum tomentosum* Michx.

Euphorbia sp.
C. euphorbiaecola Atk.
Euphorbia corollata L.
C. Euphorbiae Kell. & Sw.
C. heterospora Ell. & Ev.
Euphorbia pulcherrima Willd.
C. pulcherrimae Tharp
C. pulcherrimae minima Tharp
Eustachys petraea (Sw.) Desv. = Chloris petraea Sw.
{Eustoma Andrewsii A. Nels.
{Eustoma Russellianum (Hook.) Griseb.
C. Eustomae Peck
C. nepheloides Ell. & Holw.
Eustoma silenifolium Salisb.
C. nepheloides Ell. & Holw.
Falcata comosa (L.) Kuntze = Amphicarpa monoica (L.) Ell.
Ficus carica L.
C. Bolleana (Thuem.) Speg.
C. Fici Heald & Wolf
C. Ficina Tharp
{Fragaria vesca L.
{Fragaria virginiana Duchesne
C. vexans C. Massal.
Fraxinus sp.
C. Fraxinea Ell. & Ev.
C. Fraxinites Ell. & Ev.
C. lumbricoides Turconi & Maffei
C. superflua Ell. & Holw.
Fraxinus pennsylvanica Marsh
C. texensis Ell. & Gall.
Fraxinus viridis Michx. f. = F. pennsylvanica Marsh
Froelichia floridana (Nutt.) Moq.
C. crassoides Davis
Galactia spp.
C. flagellifera Atk.
C. Galactiae Ell. & Ev.
{Galium Aparine L.
{Galium asprellum Michx.
C. Galii Ell. & Holw.
Galium pilosum Ait.
C. Galii Ell. & Holw.
C. tenuis Peck
{Galium pilosum Ait. var. puncticulosum (Michx.) Torr. & Gray
{Galium tinctorium L.
C. Galii Ell. & Holw.
Galium trifidum Ait.
C. punctoidea Ell. & Holw.
Galium triflorum Michx.
C. Galii Ell. & Holw.
Garrya elliptica Dougl.
C. Garryae Harkn.
C. glomerata Harkn.
Gaultheria procumbens L.
C. Gaultheriae Ell. & Ev.
Gaura biennis L.
C. Gaurae Kell. & Sw.
Gayophytum diffusum Torr. & Gray
C. Gayophyti Ell. & Ev.
Gentiana crinita Froel.
C. gentianicola Ell. & Ev.
Gentiana linearis Froel.
C. Gentianae Peck
{Geranium carolinianum L.
{Geranium maculatum L.
C. Geranii Kell. & Sw.
{Gerardia grandiflora Benth.
{Gerardia punctata Robins.
C. Gerardiae Ell. & Dearn.
Gerardia quercifolia Pursh = G. virginica (L.) BSP.
Gerardia virginica (L.) BSP.
C. clavata (Ger.) Peck
C. Gerardiae Ell. & Dearn.
Gleditsia triacanthos L.
C. condensata Ell. & Kell.
C. olivacea (Berk. & Rav.) Ell.
Glottidium floridanum DC. = Sesbania platycarpa Pers.
Glycine Apios L. = Apios tuberosa Moench
Glycine hispida = G. Max Merr.
Glycine Max Merr.
C. canescens Ell. & Mart.
C. cruenta Sacc.
Glycine Soja Sieb. & Zucc. = G. Max Merr.
Gnaphalium spp.
C. Gnaphaliacea Cooke
Gnaphalium decurrens Ives
C. Gnaphalii Harkn.
{Gnaphalium polycephalum Michx.
{Gnaphalium purpureum L.
C. Gnaphaliacea Cooke

Gomphocarpus cordifolius Benth.
C. Hanseni Ell. & Ev.
Gomphocarpus viridiflorus (Raf.) Spreng. = Acerates viridiflora (Raf.) Eaton
Gonolobus hirsutus Michx. = Vincetoxicum hirsutum (Michx.) Britt.
{Gossypium sp.
{Gossypium barbadense L.
C. Gossypina Cooke
Gossypium Cavanillesianum Tod.
C. Althaeina Sacc.
Gossypium herbaceum L.
C. Gossypina Cooke
Gossypium hirsutum Cav. = G. Cavanillesianum Tod.
Gratiola pilosa Michx.
C. Gratiolae Ell. & Ev.
{Grindelia sp.
{Grindelia squarrosa (Pursh) Dunal
C. Grindeliae Ell. & Ev.
Grossularia reclinata (L.) Mill. = Ribes Grossularia L.
Gymnocarpus sp. = Uapaca sp.
Gymnocladus canadensis Lam. = G. dioica (L.) Koch
Gymnocladus dioica (L.) Koch
C. Gymnocladi Ell. & Kell.
Halenia deflexa (Sm.) Griseb.
C. gentianicola Ell. & Ev.
Hamamelis virginiana L.
C. Hamamelidis Ell. & Ev.—N. Am. Fungi, 2586, nomen nudum.
Hedera sp.
C. Ampelopsidis Peck
Helenium microcephalum DC.
C. Helenii Tharp
Helianthus sp.
C. Helianthi Ell. & Ev.
Helianthus annuus L.
C. pachypus Ell. & Kell.
{Helianthus doronicoides Lam.
{Helianthus hirsutus Raf.
C. Helianthi Ell. & Ev.
Helianthus lenticularis Dougl. = H. annuus L.
{Helianthus Maximiliani Schrad.
{Helianthus occidentalis Riddell
C. Helianthi Ell. & Ev.
Helianthus petiolaris Nutt.
C. pachypus Ell. & Kell.
Helianthus rigidus Desf. = H. scaberrimus Ell.
{Helianthus scaberrimus Ell.
{Helianthus strumosus L.
{Helianthus tuberosus L.
C. Helianthi Ell. & Ev.
Heliotropium curassavicum L.
C. Heliotropii Ell. & Ev.
Hemerocallis fulva L.
C. Hemerocallis Tehon
Herpetica alata (L.) Raf. = Cassia alata L.
Heteromeles arbutifolia Roem.
C. Heteromeles Harkn.
Heuchera americana L.
C. Heucherae Ell. & Mart.
Hibiscus esculentus L.
C. Althaeina Sacc.
C. brachypoda Speg.
C. Hibisci Tracy & Earle
Hibiscus tiliaceus L.
C. Hibisci Tracy & Earle
C. Hibiscina Ell. & Ev.
Hicoria pecan Britt. = Carya illinoensis (Wang.) K. Koch
Hieracium venosum L.
C. Hieracii Ell. & Ev.
{Holcus halepensis L.
{Holcus Sorghum L.
C. Sorghi Ell. & Ev.
Houstonia coerulea L.
C. Houstoniae Ell. & Ev.
Hybanthus concolor (Forst.) Spreng.
C. columbiensis Ell. & Ev.
Hydrangea sp.
C. Hydrangeae Ell. & Ev.
C. Hydrangeana Tharp
Hydrangea arborescens L.
C. arborescentis Tehon & Daniels
{Hydrocotyle spp.
{Hydrocotyle americana L.
{Hydrocotyle Canbyi Coult. & Rose
{Hydrocotyle interrupta Muhl.
{Hydrocotyle umbellata L.
{Hydrocotyle verticillata Thunb.
C. Hydrocotyles Ell. & Ev.
Hydrolea ovata Nutt.
C. Namae Dearn. & House

{Hymenocallis sp.
{Hymenocallis caribaea Herb.
C. Amaryllidis Ell. & Ev.
Hymenocallis crassifolia Herb.
C. Pancratii Ell. & Ev.
Hymenocallis declinata Roem. = H. caribaea Herb.
Hypericum adpressum Bart.
C. Hyperici Tehon & Daniels
Hyptis sp.
C. Ellissii Sacc. & Syd.
Ichthyomethia piscipula L. = Piscidia Erythrina L.
Ilex glabra (L.) Gray
C. Ilicis Ell.
Ilex opaca Ait.
C. ilicicola Lieneman, nom. nov.
C. Pulvinula Cooke & Ell.
Ionidium concolor Benth. & Hook. = Hybanthus concolor (Forst.) Spreng.
Ipomoea acetosaefolia Roem. & Schult.
C. sp., acc. to Torr. Bot. Club Bull. **28**: 84. 1901.
{Ipomoea lacunosa L.
{Ipomoea pandurata (L.) Meyer
C. Ipomoeae Wint.
Ipomoea purpurea (L.) Roth.
C. alabamensis Atk.
C. Ipomoeae Wint.
C. viridula Ell. & Ev.
Ipomoea stolonifera (Cyrill.) Poir.
C. Convolvuli Tracy & Earle
Isanthus brachiatus (L.) BSP.
C. Isanthi Ell. & Kell.
Isanthus caeruleus Michx. = I. brachiatus (L.) BSP.
Isopyrum biternatum (Raf.) Torr. & Gray
C. Merrowii Ell. & Ev.
Isopyrum thalictroides L.
The only mention of this host for *C. Merrowii* is Syll. Fung. **11**: 625. 1895.
Jatropha stimulosa Michx.
C. Jatrophae Atk.
{Juglans cinerea L.
{Juglans nigra L.
C. Juglandis Kell. & Sw.
Juniperus communis L. var. alpina Gaud.
C. Sequoiae Ell. & Ev.
Juniperus virginiana L.
C. Sequoiae Juniperi Ell. & Ev.
Jussiaea decurrens (Walt.) DC. = Jussieua decurrens (Walt.) DC.
Jussiaea leptocarpa Nutt. = Jussieua leptocarpa Nutt.
{Jussieua decurrens (Walt.) DC.
{Jussieua leptocarpa Nutt.
C. Jussieuae Atk.
Kalmia latifolia L.
C. Kalmiae Ell. & Ev.
C. sparsa Cooke
Lagenaria vulgaris Ser. = Cucurbita Lagenaria L.
Lagerstroemia indica L.
C. Lythracearum Heald & Wolf
Lathyrus latifolius L.
C. Lathyrina Ell. & Ev.
Lathyrus maritimus (L.) Bigel.
C. Lathyri Dearn. & House
{Lathyrus palustris L.
{Lathyrus venosus Muhl.
C. Viciae Ell. & Holw.
Laurus Benzoin L.
C. Smilacina Sacc.
Leonotis nepetaefolia R. Br.
C. Leonotidis Cooke
Leonotis ovata Boj. = L. nepetaefolia R. Br.
{Lepachys columnaris (Sims) Torr. & Gray
{Lepachys pinnata (Vent.) Torr. & Gray
C. Ratibidae Ell. & Barth.
{Lepidium sp.
{Lepidium campestre (L.) R. Br.
{Lepidium virginicum L.
C. Lepidii Peck
Lespedeza ? sp.
C. flagellifera Atk.
Lespedeza capitata Michx.
C. flagellifera Atk.
C. latens Ell. & Ev.
C. Lespedezae Ell. & Dearn.
Lespedeza frutescens (L.) Britt
C. flagellifera Atk.

Ligustrum sp.
C. adusta Heald & Wolf
C. Ligustri Roum.
Ligustrum californicum Hort. = Ligustrum ovalifolium Hassk.
Ligustrum japonicum Thunb.
C. Ligustri Roum.
Ligustrum ovalifolium Hassk.
C. adusta Heald & Wolf
Lilium longiflorum Thunb.
C. unicolor Sacc. & Penz.
Linum virginianum L.
C. Lini Ell. & Ev.
{Lippia lanceolata Michx.
{Lippia nodiflora (L.) Michx.
C. Lippiae Ell. & Ev.
Liquidambar Styraciflua L.
C. Liquidambaris Cooke & Ell. U. S. D. A. Bull. 1366. 1926, nomen nudum.
C. tuberculans Ell. & Ev.
Liriodendron Tulipifera L.
C. Liriodendri Ell. & Harkn.
Litsea geniculata (Walt.) Nicholson
C. olivacea (Berk. & Rav.) Ell.
Lobelia amoena Michx.
C. effusa (Berk. & Curt.) Ell.
C. Lobeliae Kell. & Sw.
{Lobelia cardinalis L.
{Lobelia inflata L.
{Lobelia puberula Michx.
C. effusa (Berk. & Curt.) Ell.
Lobelia syphilitica L.
C. effusa (Berk. & Curt.) Ell.
C. Lobeliae Kell. & Sw.
Lonicera spp.
C. antipus Ell. & Holw.
C. varia Peck
{Lonicera flava Sims
{Lonicera glaucescens Rydb.
{Lonicera hirsuta Eat.
{Lonicera Sullivantii Gray
C. antipus Ell. & Holw.
Ludwigia alternifolia L.
C. Ludwigiae Atk.
Lupinus diffusus Nutt.
C. Lupini Cooke
Lupinus perennis L.
C. filispora Peck
C. longispora Peck
Lupinus pilosus L.
C. longispora Peck
Lupinus subcarnosus Hook.
C. lupinicola Lieneman, nom. nov.
Lupinus texensis Hook. = L. subcarnosus Hook.
Lycium halimifolium Mill.
C. Lycii Ell. & Halst.
Lycium vulgare Dunal = L. halimifolium Mill.
Lycopersicum esculentum Mill.
C. canescens Ell. & Mart.
C. cruenta Sacc.
Lycopus rubellus Moench
C. Lycopi Ell. & Ev.
Lysimachia stricta Ait. = L. terrestris (L.) BSP.
Lysimachia terrestris (L.) BSP.
C. Lysimachiae Ell. & Halst.
Lythrum alatum Pursh
C. Lythri (Westd.) Niessl.
Maclura aurantiaca Nutt. = M. pomifera (Raf.) Schneider
Maclura pomifera (Raf.) Schneider
C. Maclurae Ell. & Ev.
Magnolia glauca L. = M. virginiana L.
Magnolia virginiana L.
C. Magnoliae Ell. & Harkn.
Maianthemum bifolium DC.
C. Majanthemi Fckl.
Maianthemum canadense Desf.
C. Majanthemi Fckl.
C. subsanguinea Ell. & Ev.
Malachra alcaefolia Jacq. = M. capitata L.
Malachra capitata L.
C. Malachrae Heald & Wolf
Malachra rotundifolia Schrank = M. capitata L.
Mallotus japonicus Muell. = Rottlera japonica Spreng.
Malus sylvestris Mill. = Pyrus Malus L.
Malva spp.
C. Althaeina Sacc.
Manihot esculenta Crantz = M. utilissima Pohl

Manihot Manihot (L.) Cockerell = M. utilissima Pohl
Manihot utilissima Pohl
C. *Cassavae* Ell. & Ev.
Marrubium vulgare L.
C. *Marrubii* Tharp
Martynia louisiana Mill.
C. *beticola* Sacc.
Medicago arabica Huds.
C. *Medicaginis* Ell. & Ev.
Medicago denticulata Willd. = M. hispida Gaertn.
{Medicago hispida Gaertn.
{Medicago lupulina L.
C. *Medicaginis* Ell. & Ev.
Medicago maculata Sibth. = M. arabica Huds.
Medicago sativa L.
C. *helvola* Sacc. var. *Medicaginis* Chester
C. *Medicaginis* Ell. & Ev.
Megapterium Fremontii (Wats.) Britt. = Oenothera Fremontii Wats.
Meibomia grandiflora Kuntze = Desmodium grandiflorum (Walt.) DC.
Meibomia mollis = Desmodium molle DC.
Melia Azedarach L.
C. *leucosticta* Ell. & Ev.
C. *Meliae* Ell. & Ev.
Melilotus alba Desf.
C. *Davisii* Ell. & Ev.
Menispermum canadense L.
C. *Menispermi* Ell. & Holw.
Mentha arvensis L. var. canadensis (L.) Briquet
C. *menthicola* Tehon & Daniels
Mentha canadensis L. = M. arvensis L. var. canadensis (L.) Briquet
Micrampelis lobata (Michx.) Greene = Echinocystis lobata (Michx.) Torr. & Gray
Mikania scandens (L.) Willd.
C. *Mikaniae* Ell. & Ev.
Mimulus alatus Ait.
C. *Mimuli* Ell. & Ev.
Mirabilis Jalapa L.
C. *Mirabilis* Tharp
Mitreola petiolata Torr. & Gray = Cynoctonum Mitreola (L.) Britt.
Modiola caroliniana (L.) Don
C. *Althaeina* Sacc. var. *Modiolae* Atk.
C. *Modiolae* Tharp
Modiola multifida Moench = M. caroliniana (L.) Don
Mollugo verticillata L.
C. *mollugínicola* Lieneman, nom. nov.
C. *Molluginis* Halst.
Morongia uncinata Willd. = Schrankia uncinata Willd.
Morus sp.
C. *moricola* Cooke
C. *pulvinulata* Sacc. & Wint.
Morus alba L.
C. *moricola* Cooke
Morus rubra L.
C. *moricola* Cooke
C. *pulvinulata* Sacc. & Wint.
Muhlenbergia diffusa Willd. = M. Schreberi Gmel.
{Muhlenbergia foliosa Trin.
{Muhlenbergia mexicana (L.) Trin.
{Muhlenbergia Schreberi Gmel.
{Muhlenbergia sylvatica Torr.
C. *Muhlenbergiae* Atk.
Myrica carolinensis Mill.
C. *diffusa* Ell. & Ev.[1]
Myrica cerifera L.
C. *diffusa* Ell. & Ev.[1]
C. *dispersa* Ell. & Ev.
C. *Myricae* Tracy & Earle
C. *penicillus* Ell. & Ev.
Nabalus altissima (L.) Hook = Prenanthes altissima L.
Nabalus aspera (Michx.) Torr. & Gray = Prenanthes aspera Michx.
Nama ovata (Nutt.) Britt. = Hydrolea ovata Nutt.
Nasturtium palustre (L.) DC. = Radicula palustris (L.) Moench
Negundo aceroides Moench = Acer Negundo L.

[1] This species of *Cercospora*, otherwise known on members of the Solanaceae, is reported on this host in the U. S. D. A. Bull. 1366. 1926.

Negundo fraxinifolium Nutt. = Acer Negundo L.
Nelumbo lutea (Willd.) Pers.
 C. Nelumbonis Tharp
Nelumbo luteum Willd. = N. lutea (Willd.) Pers.
Nepeta Cataria L.
 C. Nepetae Tehon
Nerium Oleander L.
 C. neriella Sacc.
Nesaea verticillata HBK. = Decodon verticillatus (L.) Ell.
{Nicotiana repanda Willd.
{Nicotiana Tabacum L.
 C. Nicotianae Ell. & Ev.
Nymphaea (cultivated)
 C. exotica Ell. & Ev.
 C. Nymphaeaceae Cooke & Ell.
Nymphaea odorata Ait. = Castalia odorata (Ait.) Woodville & Wood
Nyssa multiflora Wang. = N. sylvatica Marsh
Nyssa sylvatica Marsh
 C. Nyssae Tharp
Oenothera biennis L.
 C. didymospora Ell. & Barth.
 C. Oenotherae Ell. & Ev.
Oenothera Fremontii Wats.
 C. didymospora Ell. & Barth.
Oenothera laciniata Hill
 C. Oenotherae-sinuatae Atk.
Oenothera sinuata L. = O. laciniata Hill
Onagra biennis Scop. = Oenothera biennis L.
Oryza sativa L.
 C. Oryzae Miyake
{Osmorhiza Claytonia (Michx.) Clarke
{Osmorhiza longistylis (Torr.) DC.
 C. Osmorhizae Ell. & Ev.
{Oxybaphus hirsutus (Pursh) Sweet
{Oxybaphus nyctagineus (Michx.) Sweet
 C. Oxybaphi Ell. & Halst.
Oxydendrum arboreum (L.) DC.
 C. Oxydendri Tracy & Earle
Padus americana (L.) Mill. = Prunus virginiana L.
Paeonia officinalis L.
 C. Paeoniae Tehon & Daniels
 C. variicolor Wint.
Pancratium coronarium LeConte = Hymenocallis crassifolia Herb.
Panicum dichotomum L.
 C. fusimaculans Atk.
Panicum latifolium L.
 C. Panici Davis
Pariti tiliaceum (L.) St. Hil. = Hibiscus tiliaceus L.
Parosela enneandra (Nutt.) Britt. = Dalea enneandra Nutt.
Parthenocissus quinquefolia Planch.
 C. Ampelopsidis Peck
Passiflora sp.
 C. regalis Tharp
Passiflora incarnata L.
 C. biformis Peck
 C. fuscovirens Sacc.
 C. truncatella Atk.
Passiflora lutea L.
 C. fuscovirens Sacc.
Passiflora sexflora Juss.
 C. biformis Peck
Pastinaca sativa L.
 C. Apii Fres.
 C. Pastinacae (Sacc.) Peck
Pelargonium spp.
 C. Brunkii Ell. & Gall.
Peltandra alba Raf. = P. sagittaefolia (Michx.) Morong
Peltandra sagittaefolia (Michx.) Morong
 C. pachyspora Ell. & Ev.
Peltandra virginica (L.) Kunth.
 C. Callae Peck & Clint.
 C. pachyspora Ell. & Ev.
Penthorum sedoides L.
 C. sedoidis Ell. & Ev.
{Pentstemon Cobaea Nutt.
{Pentstemon grandiflorus Nutt.
{Pentstemon hirsutus (L.) Willd.
 C. Pentstemonis Ell. & Kell.
Pentstemon pubescens Soland. = P. hirsutus (L.) Willd.
Pepo foetidissima (HBK.) Britt. = Cucurbita foetidissima HBK.
Persea americana Mill.
 C. sp. Stevenson, Fla. Agr. Sta. Bull. 161: 3-23. 1922; Myc. **15**: 145. 1923; U. S. D. A. Bull. 1366. 1926.
Persea gratissima Gaertn. = P. americana Mill.

Persea palustris (Raf.) Sarg.
C. purpurea Cooke
Persica vulgaris Mill. = Prunus Persica (L.) Sieb. & Zucc.
Persicaria Hydropiper (L.) Opiz. = Polygonum Hydropiper L.
Persicaria punctata (Ell.) Small = Polygonum acre HBK.
Petroselinum hortense Hoffm.
C. Apii Fres.
Petunia hybrida Hort.
C. sp.—mentioned in U. S. D. A. Bull. 1366. 1926.
Petunia parviflora Juss.
C. canescens Ell. & Mart.
Peucedanum graveolens (L.) Benth. & Hook. = Anethum graveolens L.
Peucedanum sativum (L.) Benth. & Hook. = Pastinaca sativa L.
Phaseolus sp.
C. canescens Ell. & Mart.
C. columnaris Ell. & Ev.
C. cruenta Sacc.
C. Phaseolorum Cooke
Phaseolus lunatus L.
C. canescens Ell. & Mart.
C. cruenta Sacc.
C. Phaseolorum Cooke
Phaseolus vulgaris L.
C. canescens Ell. & Mart.
C. cruenta Sacc.
Philadelphus spp.
Philadelphus coronarius L.
C. angulata Wint.
Phleum pratense L.
C. graminicola Tracy & Earle
Phlox spp.
C. Phlogina Peck
C. omphakodes Ell. & Holw.
Phlox amoena Sims
Phlox divaricata L.
Phlox floridana Benth.
Phlox maculata L.
C. omphakodes Ell. & Holw.
Photinia arbutifolia Lindl. = Heteromeles arbutifolia Roem.
Physalis spp.
C. Physalidis Ell.
Physalis heterophylla Nees
C. diffusa Ell. & Ev.
C. Physalidis Ell.
Physalis lanceolata Michx.
C. diffusa Ell. & Ev.
Physalis pubescens L.
C. Physalidis Ell.
Physalis virginiana Mill.
C. physalicola Ell. & Barth.
Physalis virginica Gray = P. virginiana Mill.
Phytolacca americana L.
Phytolacca decandra L.
Phytolacca icosandra L.
C. flagellaris Ell. & Mart.
Piaropus crassipes Raf. = Eichhornia speciosa Kunth
Piaropus crassipes (Mart.) Britt. = Eichhornia speciosa Kunth
Pimpinella integerrima (L.) Gray = Taenidia integerrima (L.) Drude
Piscidia Erythrina L.
C. Ichthyomethiae Dearn. & Barth.
Plantago lanceolata L.
Plantago lusitanica L.
Plantago major L.
C. Plantaginis Sacc.
Plantago Rugelii Decne.
C. Plantaginella Tehon
Platanus occidentalis L.
C. platanicola Ell. & Ev.
Pleiotaenia Nuttallii (DC.) Coult. & Rose = Polytaenia Nuttallii DC.
Podophyllum peltatum L.
C. Podophylli Tehon & Daniels
Polygala cruciata L.
Polygala lutea L.[1]
C. grisea Cooke & Ell.
Polygonum spp.
C. Polygonacea Ell. & Ev.

[1] Saccardo (Syll. Fung. 4: 434. 1886) lists this as a host for *Cercospora minuta* Cooke & Ell., with reference to Grev. 5: 49. 1876. No such species is listed in that place, but instead is *C. grisea* Cooke & Ell. and only on *Polygala lutea* L. So far as can be determined, Cooke and Ell. never published a *C. minuta* and if regarded as distinct it should be referred to Sacc. for authorship.

Polygonum acre HBK.
C. Hydropiperis (Thuem.) Speg.
Polygonum aviculare L.
C. avicularis Wint.
{Polygonum Convolvulus L.
{Polygonum dumetorum L.
C. Polygonacea Ell. & Ev.
Polygonum erectum L.
C. avicularis Wint.
{Polygonum Hydropiper L.
{Polygonum pennsylvanicum L.
C. Hydropiperis (Thuem.) Speg.
Polygonum punctatum Ell. = P. acre HBK.
Polygonum sagittatum L.
C. avicularis Wint. var. *Sagittati* Atk.
Polygonum scandens L.
C. Polygonacea Ell. & Ev.
Polypodium Phyllitidis L.
C. Phyllitidis Hume
Polytaenia Nuttallii DC.
C. Polytaeniae Ell. & Ev.
Pontederia cordata L.
C. Pontederiae Ell. & Dearn.
Populus alba L.
C. Populina Ell. & Ev.
Populus angulata Ait. = P. deltoides Marsh
Populus deltoides Marsh
C. populicola Tharp
C. Populina Ell. & Ev.
C. reducta Syd.
Populus dilatata Ait.
C. Populina Ell. & Ev.
Populus monilifera Ait. = P. deltoides Marsh
Potentilla palustris (L.) Scop.
C. Comari Peck
Prenanthes alba L.
C. brunnea Peck
C. tabacina Ell. & Ev.
Prenanthes altissima L.
C. brunnea Peck
C. effusa (Berk. & Curt.) Ell.
{Prenanthes aspera Michx.
{Prenanthes crepidinea Michx.
C. Prenanthis Ell. & Kell.
Prosopis glandulosa Torr.
C. Prosopidis Heald & Wolf
Prunus sp.
C. rosicola Pass.
Prunus americana Marsh
C. circumscissa Sacc.
C. prunicola Ell. & Ev.
Prunus armeniaca L.
C. circumscissa Sacc.
Prunus Avium L.
C. Cerasella Sacc.
C. circumscissa Sacc.
Prunus Cerasus L.
C. Cerasella Sacc.
C. rubrotincta Ell. & Ev.
Prunus communis Fritsch
C. circumscissa Sacc.
Prunus demissa D. Dietr. = P. virginiana L.
{Prunus domestica L.
{Prunus pennsylvanica L.
C. circumscissa Sacc.
Prunus Persica (L.) Sieb. & Zucc.
C. circumscissa Sacc.
C. consobrina Ell. & Ev.
C. rubrotincta Ell. & Ev.
{Prunus serotina Ehrh.
{Prunus spinosa L.
C. circumscissa Sacc.
Prunus virginiana L.
C. Cerasella Sacc.
C. circumscissa Sacc.
Psedera quinquefolia (L.) Greene
C. Ampelopsidis Peck
C. psedericola Tehon
Psoralea argophylla Pursh
C. latens Ell. & Ev.
Ptelea trifoliata L.
C. afflata Wint.
C. Pteleae Wint.
Ptiloria virgata (Benth.) Greene = Stephanomeria virgata Benth.
Punica Granatum L.
C. Lythracearum Heald & Wolf
Pyrus arbutifolia (L.) L. f.
C. Pyri Farlow
Pyrus communis L.
C. minima Tracy & Earle
C. Pyri Farlow

Pyrus japonica (Pers.) Thunb.
 C. Cydoniae Ell. & Ev.
Pyrus Malus L.
 C. Mali Ell. & Ev.
Pyrus melanocarpa (Michx.) Willd.
 C. Pyri Farlow
Quercus chrysolepis Liebm.
 C. macrochaeta Ell. & Ev.
Quercus virens Ait. = Q. virginiana Mill.
Quercus virginiana Mill.
 C. polytricha Cooke
Radicula Armoracia (L.) Robins.
 C. Armoraciae Sacc.
{Radicula Nasturtium-aquaticum (L.) Britten & Rendle
Radicula palustris (L.) Moench
Radicula sylvestris (L.) Druce
 C. Nasturtii Pass.
Rafinesquia californica Nutt.
 C. Rafinesquiae Harkn.
{Ranunculus repens L.
Ranunculus septentrionalis Poir.
 C. Ranunculi Ell. & Holw.
Raphanus sativus L.
 C. atrogrisea Ell. & Ev.
 C. Cruciferarum Ell. & Ev.
Ratibida columnaris (Sims) Don = Lepachys columnaris (Sims) Torr. & Gray
Reseda odorata L.
 C. Resedae Fckl.
Rhamnus sp.
 C. aeruginosa Cooke
{Rhamnus alnifolia L'Her.
Rhamnus cathartica L.
 C. Rhamni Fckl.
Rheum Rhaponticum L.
 C. Rhapontici Tehon & Daniels
{Rhexia mariana L.
Rhexia virginica L.
 C. erythrogena Atk.
Rhus aromatica Ait. = R. canadensis Marsh
Rhus canadensis Marsh
 C. Rhuina Cooke & Ell.
Rhus copallina L.
 C. Rhuina Cooke & Ell.
 C. Rhuina Cooke & Ell. var. *nigromaculans* Peck
{Rhus Cotinus L.
Rhus glabra L.
Rhus hirta (L.) Sudw.
Rhus pumila Michx.
 C. Rhuina Cooke & Ell.
Rhus Toxicodendron L.
 C. Bartholomaei Ell. & Kell.
 C. Rhuina Cooke & Ell.
 C. Toxicodendri Ell.
Rhus typhina L. = R. hirta (L.) Sudw.
Rhus venenata DC. = R. Vernix L.
Rhus Vernix L.
 C. infuscans Ell. & Ev.
 C. Rhuina Cooke & Ell.
Rhynchospora glomerata (L.) Vahl = R. glomerata (L.) Vahl
Ribes sp.
 C. Ribis Earle
Ribes aureum Pursh
 C. ribicola Ell. & Ev.
Ribes bracteosum Douglas
 C. coalescens Davis
Ribes Grossularia L.
 C. sp.—mentioned in U. S. D. A. Bull. 1366. 1926.
Ribes sanguineum Pursh
 C. ribicola Ell. & Ev.
Ribes tenuiflorum Lindl. = R. aureum Pursh
Ribes vulgare Lam.
 C. angulata Wint.
Richardia africana Kunth.
 C. richardiaecola Atk.
Richardia scabra St. Hil.
 C. Carveriana Sacc. & D. Sacc.
Richardsonia scabra St. Hil. = Richardia scabra St. Hil.
Ricinus communis L.
 C. canescens Ell. & Mart.
 C. Ricinella Sacc. & Berl.
Ridan alternifolius (L.) Britt. = Actinomeris alternifolia (L.) DC.
Rivina laevis L.
 C. flagellaris Ell. & Mart.
Roripa Armoracia (L.) Hitchc. = Armoracia rusticana Gaertn., Mey. & Scherb.

Rosa spp.
  C. rosicola Pass.
  C. Rosigena Tharp
Rosa arkansana Porter
  C. rosicola Pass.
Rosa blanda Ait.
  C. rosicola Pass. var. *undosa* Davis
Rosa carolina L.
  C. rosicola Pass.
Rosa humilis Marsh
  C. rosicola Pass. var. *undosa* Davis
Rottlera japonica Spreng.
  C. Malloti Ell. & Ev.
Rubus spp.
  C. bliti Tharp
  C. Rubi Sacc.
Rubus canadensis L.
  C. septorioides Ell. & Ev.
  C. Rubi Sacc.
{Rubus cuneifolius Pursh
{Rubus fructicosus L.
{Rubus villosus Ait.
  C. Rubi Sacc.
Rudbeckia hirta L.
  C. tabacina Ell. & Ev.
Rudbeckia laciniata L.
  C. Rudbeckiae Peck
  C. tabacina Ell. & Ev.
Rudbeckia triloba L.
  C. tabacina Ell. & Ev.
{Ruellia ciliosa Pursh
{Ruellia parviflora (Nees) Britt.
  C. consociata Wint.
Rumex Acetosella L.
  C. Acetosellae Ell.
Rumex crispus L.
  C. Acetosellae Ell. var. *maculosa* Peck
Rynchospora glomerata (L.) Vahl
  C. crinospora Atk.
Sabbatia angularis (L.) Pursh
  C. Sabbatiae Ell. & Ev.
Saccharum officinarum L.
  C. vaginae Kreuger
{Sagittaria heterophylla Pursh
{Sagittaria lancifolia L.
{Sagittaria latifolia Willd.
  C. Sagittariae Ell. & Kell.
Sagittaria variabilis Engelm. = S. latifolia Willd.
{Salix spp.
{Salix nigra Marsh
  C. Salicina Ell. & Ev.
Salvia farinacea Benth.
  C. salviicola Tharp
Sambucus spp.
  C. lateritia Ell. & Halst.
Sambucus canadensis L.
  C. catenospora Atk.
  C. Depazeoides (Desm.) Sacc.
{Sambucus nigra L.
{Sambucus pubens Michx.
{Sambucus racemosa L.
  C. lateritia Ell. & Halst.
Sanguinaria canadensis L.
  C. Sanguinariae Peck
Sanicula gregaria Bicknell
  C. Saniculae Davis
Saururus cernuus L.
  C. Saururi Ell. & Ev.
Schrankia uncinata Willd.
  C. Morongiae Tracy & Earle
Scutellaria cordifolia Muhl. = S. versicolor Nutt.
Scutellaria versicolor Nutt.
  C. Scutellariae Ell. & Ev.
Sechium edule (Jacq.) Sw.
  C. Cucurbitae Ell. & Ev.
Sedum sp.
  C. Sedi Ell. & Ev.
Selinum Gmelini Bray
  C. Apii Fres. var. *Selini-Gmelini* Sacc. & Scalia
Senecio aureus L.
  C. Senecionis Ell. & Ev.
Sepium sebiferum (L.) Roxb.
  C. Stillingiae Ell. & Ev.
Sequoia gigantea DC.
  C. Sequoiae Ell. & Ev.
Sesbania platycarpa Pers.
  C. glotidiicola Tracy & Earle
Setaria glauca (L.) Beauv.
  C. Setariae Atk.
  C. setariicola Tehon & Daniels
  C. striaeformis
Sicyos angulatus L.
  C. Echinocystis Ell. & Mart.
Sida spinosa L.
  C. sidaecola Ell. & Ev.

Sium cicutaefolium Schrank
C. Sii Ell. & Ev.
{Silphium compositum Michx.
{Silphium integrifolium Michx.
C. Silphii Ell. & Ev.
Silphium laciniatum L.
C. Silphii Ell. & Ev. var. *laciniati* Tehon & Daniels
Sisymbrium officinale (L.) Scop.
C. Cruciferarum Ell. & Ev.
C. Nasturtii Pass.
Smilacina canadensis Pursh = Maianthemum canadense Desf.
Smilacina sessilifolia Nutt.
C. Smilacinae Ell. & Ev.
Smilax sp.
C. nubilosa Ell. & Ev. See note concerning *C. nubilosa*.
Smilax spp.
C. Smilacis Thuem.
{Smilax aspera L.
{Smilax bona-nox L.
C. Smilacina Sacc.
Smilax glauca Walt.
C. Smilacina Sacc.
C. Smilacis Thuem.
Smilax hispida Muhl.
C. Smilacis Thuem.
Smilax laurifolia L.
C. Smilacina Sacc.
{Smilax rotundifolia L.
{Smilax tamnifolia Michx.
C. Smilacis Thuem.
Soja max (L.) Moench = Glycine Max Merr.
Solanum carolinense L.
C. atromarginalis Atk.
C. carolinensis Tharp
Solanum Dulcamara L.
C. Dulcamarae (Peck) Ell.
Solanum nigrum L.
C. atromarginalis Atk.
C. nigri Tharp
C. rigospora Atk.
Solanum tuberosum L.
C. concors (Casp.) Sacc.
C. solanicola Atk.
{Solidago latifolia L.
{Solidago serotina Ait.
C. stomatica Ell. & Davis
Sophronanthe pilosa (Michx.) Small = Gratiola pilosa Michx.
Sorghum halepensis (L.) Pers. = Holcus halepensis L.
Sorghum vulgare Pers. = Holcus Sorghum L.
Spathyema Foetida (L.) Raf. = Symplocarpus foetidus (L.) Nutt.
Spermacoce ocymoides Burm. = Borreria micrantha Torr. & Gray
Spinacia oleracea L.
C. beticola Sacc.
C. dubia (Riess) Wint.
C. flagelliformis Ell. & Halst.
Spiraea aruncus L.
C. sp.—Wisc. Acad. Trans. **15:** 779. 1907.
{Spiraea sp.
{Spiraea salicifolia L.
C. Rubigo Cooke & Harkn.
Sporobolus asper (Michx.) Kunth
C. seriata Atk.
Stachys palustris L.
C. Stachydis Ell. & Ev.
Stephanomeria virgata Benth.
C. clavicarpa Ell. & Ev.
Stillingia sebifera Michx. = Sepium sebiferum (L.) Roxb.
Stizolobium Deeringianum Bort.
C. Mucunae Syd. U. S. D. A. Bull. 1366. 1926.
C. Stizolobii Syd. U. S. D. A. Bull. 1366. 1926.
Streptopus amplexifolius (L.) DC.
C. Streptopi Dearn. & Barth.
Stylisma humistrata (Walt.) Chapm. = Breweria humistrata (Walt.) Gray
Stylosanthes biflora (L.) BSP.
C. Commonsii Sacc.
Stylosanthes elatior Sw. = S. biflora (L.) BSP.
Symphoricarpos orbiculatus Moench
C. Symphoricarpi Ell. & Ev.
Symphoricarpos vulgaris Michx. = S. orbiculatus Moench

Symplocarpus foetidus (L.) Nutt.
  C. *Symplocarpi* Peck
Syringa sp.
  C. *macromaculans* Heald & Wolf
Syringa persica L.
  C. *lilacis* (Desm.) Sacc.
Taenidia integerrima (L.) Drude
  C. *platyspora* Ell. & Holw.
Tagetes patula L.
  C. *tageticola* Ell. & Ev.
Tecoma radicans (L.) Juss. = Campsis radicans (L.) Seem.
Tephrosia hispidula (Michx.) Pers.
  C. *Tephrosiae* Atk.
Tetranthera geniculata Nees = Litsea geniculata (Walt.) Nicholson
Teucrium canadense L.
  C. *ferruginea* Fckl.
  C. *racemosa* Ell. & Mart.
  C. *Teucrii* Ell. & Kell.
Thalia dealbata Roscoe
  C. *Thaliae* Ell. & Langl.
{Thalictrum dasycarpum Fisch. & Lall.
{Thalictrum dioicum L.
  C. *fingens* Davis
Thermopsis "arenaria." Probably error for "arenosa" Nels.
  C. *Thermopsidis* Earle
{Tilia americana L.
{Tilia cordata Mill.
  C. *microsora* Sacc.
Tilia europaea L. = T. cordata Mill.
Tiniaria convolvulus (L.) Webb. & Mod. = Polygonum Convolvulus L.
Tiniaria dumetorum (L.) Opiz. = Polygonum dumetorum L.
Tithymalopsis corollata (L.) Kl. & Garcke = Euphorbia corollata L.
Toxylon pomiferum Raf. = Maclura pomifera (Raf.) Schneider
Tracaulon sagittatum (L.) Small = Polygonum sagittatum L.
Trachelospermum difforme (Walt.) Gray
  C. *repens* Ell. & Ev.
Tragia nepetaefolia Cav.
  C. *euphorbiaecola* Atk. var. *tragiae* Tharp
Tragopogon porrifolius L.
  C. *Tragopogonis* Ell. & Ev.
{Trifolium agrarium L.
{Trifolium dubium Sibth.
{Trifolium hybridum L.
  C. *zebrina* Pass.
Trifolium incarnatum L.
  C. *Medicaginis* Ell. & Ev.
Trifolium medium L.
  C. *zebrina* Pass.
Trifolium pratense L.
  C. *Medicaginis* Ell. & Ev.
  C. *zebrina* Pass.
Trifolium repens L.
  C. *helvola* Sacc.
  C. *zebrina* Pass.
Tropaeolum majus L.
  C. *Tropaeoli* Atk.
Uapaca sp.
  C. *inquinans* Cooke
Ulmus spp.
  C. *sphaeriaeformis* Cooke
Unifolium canadense (Desf.) Greene = Maianthemum canadense Desf.
Vagnera sessilifolia (Nutt.) Greene = *Smilacina sessilifolia* Nutt.
Verbascum Thapsus L.
  C. *verbascicola* Ell. & Ev.
Verbena sp.
  C. *papillosa* Atk.
Verbena caroliniana Michx.
  C. *septatissima* Tracy & Earle
  C. *verbenicola* Ell. & Ev.
Verbena stricta Vent.
  C. *Verbenae-strictae* Peck
Verbena Xutha Lehm.
  C. *verbenicola* Ell. & Ev.
Verbesina texana Buckl.
  C. *fulvella* Heald & Wolf
Vernonia angustifolia Michx.
  C. *Vernoniae* Ell. & Kell.
Vernonia Baldwini Torr.
  C. *oculata* Ell. & Kell.
  C. *Vernoniae* Ell. & Kell.
Vernonia fasciculata Michx.
  C. *Vernoniae* Ell. & Kell.
Vernonia noveboracensis (L.) Willd.
  C. *noveboracensis* Ell. & Ev.
  C. *Vernoniae* Ell. & Kell.
Veronica scutellata L.
  C. *tortipes* Davis

Viburnum acerifolium L.
Viburnum cassanoides L.
Viburnum Lentago L.
Viburnum Opulus L.
C. varia Peck
Viburnum plicatum
C. tinea Sacc., or less probably *C. varia* Peck.
Viburnum pubescens (Ait.) Pursh
C. varia Peck
Vicia caroliniana Walt.
Vicia sativa L.
C. Viciae Ell. & Holw.
Vigna Catjang Walp. = Vigna sinensis (L.) Endl.
Vigna luteola (Jacq.) Benth.
C. Vignae Ell. & Ev.
Vigna sinensis (L.) Endl.
C. canescens Ell. & Mart.
C. cruenta Sacc.
C. Dolichi Ell. & Ev.
C. Vignae Ell. & Ev.
Vigna unguiculata (L.) Walp. = Vigna sinensis (L.) Endl.
Vincetoxicum spp.
C. Bellynckii (Westd.) Sacc.
Vincetoxicum hirsutum (Michx.) Britt.
C. Vincetoxici Ell. & Ev.
Viola blanda Willd.
Viola conspersa Reichenb.
C. Violae Sacc.
Viola cucullata Ait.
C. granuliformis Ell. & Holw.
C. murina Ell. & Kell.
C. Violae Sacc.
Viola obliqua, of recent authors, not Hill
Viola odorata L.
C. Violae Sacc.
Viola sagittata Ait.
C. granuliformis Ell. & Holw.
Viola tricolor L.
C. Violae Sacc.
Viola villosa of recent authors = Viola hirsutula Brainerd
Vitis sp.
Vitis cordifolia Michx.
C. Vitis (Lév.) Sacc.
Vitis hederacea Ehrh.
C. psedericola Tehon
C. Ampelopsidis Peck
Vitis indivisa Willd. = Cissus Ampelopsis Pers.
Vitis labruscae L.
C. Vitis (Lév.) Sacc.
Vitis rotundifolia Michx.
C. brachypus Ell. & Ev.
C. Vitis (Lév.) Sacc.
Vitis vulpina L.
C. vulpinae Ell. & Kell.
C. Vitis (Lév.) Sacc.
Vitex Agnus-castus L.
C. Viticis Ell. & Ev.
Washingtonia longistylis (Torr.) Britt. = Osmorhiza longistylis (Torr.) DC.
Weigela sp. = Diervilla sp.
Xanthium spp.
C. xanthicola Heald & Wolf
Xanthoxylum "carolinense" (error for "carolinianum" Lam. ?) = Zanthoxylum Clava-Herculis L.
Xyris elata Chapm.
C. Xyridis Miles
Yucca filamentosa L.
Yucca gloriosa L.
C. concentrica Cooke & Ell.
Yucca rupicola Scheele
C. floricola Heald & Wolf
Zanthoxylum Clava-Herculis L.
C. Xanthoxyli Cooke
Zea Mays L.
C. Sorghi Ell. & Ev.
C. Zeae-Maydis Tehon & Daniels
Zinnia sp.
C. atricincta Heald & Wolf
Zinnia elegans Jacq.
C. atricincta Heald & Wolf
C. Zinniae Ell. & Mart.
Zinnia multiflora L.
Zinnia pauciflora L.
C. Zinniae Ell. & Mart.
Zizia aurea (L.) Koch
Zizia cordata (Walt.) DC.
C. Ziziae Ell. & Ev.
Zizia integerrima (L.) DC. = Taenidia integerrima (L.) Drude

Index of Species of Cercospora

1. *C. Absinthii* (Peck) Sacc. Syll. Fung. **4**: 444. 1886; N. Y. Mus. Rept. **30**: 54. 1878, as *Helminthosporium Absinthii* Peck; Wisc. Acad. Trans. **18**: 269. 1915.
2. *C. Abutilonis* Tehon & Daniels, Myc. **17**: 246. 1925.
3. *C. Acalyphae* Peck, N. Y. Mus. Rept. **34**: 48. 1881; Syll. Fung. **4**: 457. 1886; Jour. Myc. **1**: 20. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 46. 1892; N. J. Agr. Sta. Bull. 313: 128. 1917.
4. *C. Acalypharum* Tharp, Myc. **9**: 106. 1917.
5. *C. Acetosellae* Ell. Torr. Bot. Club Bull. **8**: 65. 1881; Syll. Fung. **4**: 454. 1886; Jour. Myc. **1**: 54. 1885.
6. *C. Acetosellae* Ell. var. *maculosa* Peck, N. Y. Mus. Rept. **40**: 64. 1887.
7. *C. Acnidae* Ell. & Ev. Acad. Phila. Proc. **1891**: 89. 1891; Syll. Fung. **10**: 637. 1892.
8. *C. adusta* Heald & Wolf, Myc. **3**: 14. 1911; B. P. I. Bull. 226: 77. 1912.
9. *C. aeruginosa* Cooke, Hedw. **17**: 39. 1878; Syll. Fung. **4**: 466. 1886; Jour. Myc. **1**: 39. 1885.
10. *C. Aesculina* Ell. & Kell. Jour. Myc. **9**: 105. 1903; Syll. Fung. **18**: 598. 1906.
11. *C. afflata* Wint. Hedw. **24**: 201. 1885; Syll. Fung. **4**: 465. 1886; Jour. Myc. **1**: 125. 1885.
12. *C. Ageratoides* Ell. & Ev. Jour. Myc. **5**: 71. 1889; Syll. Fung. **10**: 627. 1892; Wisc. Acad. Trans. **18**: 269. 1915; *l. c.* **19**: 675. 1919; N. J. Agr. Sta. Bull. 313: 128. 1917.
13. *C. Agrostidis* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 44. 1892; Syll. Fung. **10**: 656. 1892.
14. *C. alabamensis* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 51. 1892; Syll. Fung. **10**: 632. 1892.
15. *C. Alismatis* Ell. & Holw. Jour. Myc. **1**: 63. 1885; Syll. Fung. **4**: 478. 1886.
16. *C. Alternantherae* Ell. & Langl. Jour. Myc. **6**: 36. 1890; Syll. Fung. **10**: 637. 1892.
17. *C. Althaeina* Sacc. Michelia **1**: 269. 1878; Am. Nat. **16**: 810. 1882, as *C. malvicola* Ell. & Mart.; Syll. Fung. **4**: 440. 1886; Jour. Myc. **1**: 38. 1885; *l. c.* **4**: 28. 1888; *l. c.* **8**: 57. 1902; Elisha Mitchell Sci. Soc. Jour. **8**: 60. 1892; B. P. I. Bull. 226: 86. 1912; N. J. Agr. Sta. Bull. 313: 128. 1917.
18. *C. Althaeina* Sacc. var. *Modiolae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 60. 1892.
19. *C. Althaeina* Sacc. var. *praecincta* Davis, Wisc. Acad. Trans. **18**: 260. 1915.
20. *C. Amaryllidis* Ell. & Ev. Jour. Myc. **3**: 14. 1887; Syll. Fung. **10**: 653. 1892.
21. *C. Ammanniae* Tharp, Myc. **9**: 107. 1917.
22. *C. Ampelopsidis* Peck, N. Y. Mus. Rept. **30**: 55. 1876; Grev. **12**: 30. 1883, as *C. pustula* Cooke; Syll. Fung. **4**: 459. 1886; Jour. Myc. **1**: 55. 1885, as *C. pustula* Cooke; Syll. Fung. **4**: 458. 1886, as *C. pustula* Cooke; B. P. I. Bull. 226: 80. 1912, as *C. pustula* Cooke; Myc. **16**: 140. 1924.
23. *C. Anethi* Sacc. Nuovo Giorn. Bot. Ital. **23**: 219. 1916.
24. *C. angulata* Wint. Hedw. **24**: 202. 1885; Syll. Fung. **4**: 459. 1886; Jour. Myc. **1**: 124. 1885.
25. *C. anomala* Ell. & Halst. Jour. Myc. **4**: 8. 1888; Syll. Fung. **10**: 628. 1892.

26. *C. anthelmintica* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 49. 1892; Syll. Fung. **10**: 636. 1892; N. J. Agr. Sta. Bull. 313: 128. 1917.
27. *C. antipus* Ell. & Holw. Jour. Myc. **1**: 5. 1885; Syll. Fung. **4**: 469. 1886; Jour. Myc. **1**: 20. 1885; Wisc. Acad. Trans. **17**: 894. 1914; *l. c.* **21**: 278. 1924; Myc. **16**: 125. 1924.
28. *C. Apii* Fres. Beitr. Myk. 91. 1863; Syll. Fung. **4**: 442. 1886; Jour. Myc. **1**: 36. 1885; N. J. Agr. Sta. Bull. 313: 130. 1917; N. J. Agr. Sta. Rept. **37**: 594. 1917; Mich. Agr. Sta. Tech. Bull. 63. 1923.
29. *C. Apii* Fres. var. *Angelicae* Sacc. & Scalia, Harriman Alaska Exped. **5**: 16. 1904; Syll. Fung. **18**: 602. 1906.
30. *C. Apii* Fres. var. *Selini-Gmelini* Sacc. & Scalia, Harriman Alaska Exped. **5**: 16. 1904; Syll. Fung. **18**: 602. 1906.
31. *C. Apiifoliae* Tharp, Myc. **9**: 107. 1917.
32. *C. Apocyni* Ell. & Kell. Torr. Bot. Club Bull. **11**: 121. 1884; Syll. Fung. **4**: 451. 1886; Jour. Myc. **1**: 62. 1885.
33. *C. Aquilegiae* Kell. & Sw. Jour. Myc. **5**: 74. 1889; Syll. Fung. **10**: 618. 1892.
34. *C. Arborescentis* Tehon & Daniels, Myc. **17**: 246. 1925.
35. *C. arboriae* Tharp, Myc. **9**: 108. 1917.
36. *C. Arcti-Ambrosiae* Halst. Torr. Bot. Club Bull. **20**: 25. 1893.
37. *C. Arctostaphyli* Davis, Wisc. Acad. Trans. **18**: 268. 1915.[1]
38. *C. Argythamniae* Dearn. & House, N. Y. Mus. Bull. 179: 33. 1915.
39. *C. Armoraciae* Sacc. Nuovo Giorn. Bot. Ital. **8**: 188. 1876; Syll. Fung. **4**: 433. 1886; Hedw. **16**: 123. 1877; N. J. Agr. Sta. Bull. 313: 130. 1917.
40. *C. Asclepiodorae* Ell. & Kell. Jour. Myc. **4**: 6, 29. 1888; Syll. Fung. **10**: 635. 1892.
41. *C. Asiminae* Ell. & Kell. Jour. Myc. **3**: 103. 1887; Syll. Fung. **10**: 638. 1892.
42. *C. Asparagi* Sacc. Michelia **1**: 88. 1877; Syll. Fung. **4**: 477. 1886; B. P. I. Bull. 226: 34. 1912.
43. *C. Asterata* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 50. 1892; Syll. Fung. **10**: 627. 1892.
44. *C. atra* Ell. & Ev. Jour. Myc. **4**: 4. 1888; Syll. Fung. **10**: 648. 1892.
45. *C. atricincta* Heald & Wolf, Myc. **3**: 14. 1911; B. P. I. Bull. 226: 89. 1912.
46. *C. atrogrisea* Ell. & Ev. Acad. Phila. Proc. **1893**: 464. 1893; Syll. Fung. **11**: 625. 1895.
47. *C. atromaculans* Ell. & Ev. Jour. Myc. **3**: 17. 1887; Syll. Fung. **10**: 644. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 56. 1892.
48. *C. atromarginalis* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 59. 1892; Syll. Fung. **10**: 635. 1892; B. P. I. Bull. 226: 96. 1912.
49. *C. aurantia* Heald & Wolf, Myc. **3**: 15. 1911; B. P. I. Bull. 226: 27. 1912.
50. *C. avicularis* Wint. Hedw. **24**: 202. 1885; Jour. Myc. **1**: 125. 1885; Syll. Fung. **4**: 455. 1886; Ind. Acad. Proc. **1921**: 146. 1922; Wisc. Acad. Trans. **16**: 758. 1909; **17**: 891. 1914.
51. *C. avicularis* Wint. var. *Sagittati* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 48. 1892.
52. *C. Baccharidis* Ell. & Ev. Acad. Phila. Proc. **1894**: 379. 1894; Syll. Fung. **11**: 627. 1895.

[1] In *l. c.* **21**: 253. 1924, Davis says "*Cercospora arctostaphyli* Davis (Trans. Wis. Acad. **18**: 268) seems to have been founded upon a misapprehension. There is no specimen in the University of Wisconsin herbarium and the characters ascribed are those of *Cercospora gaultheriae* E. & E. It should be stricken out."

53. *C. Bartholomaei* Ell. & Kell. Jour. Myc. **5**: 144. 1889; Syll. Fung. **10**: 639. 1892.
54. *C. Bellynckii* (Westd.) Sacc. Hedw. **15**: 1. 1876; Acad. Roy. Sci. Belgique Bull. **21**[2]: 240. 1854, as *Cladosporium Bellynckii* Westd.; Syll. Fung. **4**: 450. 1886; B. P. I. Bull. 226: 103. 1912.
55. *C. beticola* Sacc. Nuovo Giorn. Bot. Ital. **8**: 189. 1876; Syll. Fung. **4**: 456 1886; Jour. Myc. **1**: 20. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 46. 1892; B. P. I. Bull. 226: 38, 43. 1912; N. J. Agr. Sta. Bull. 313: 130. 1912; Phytopath. **8**: 135. 1918.
56. *C. Bidentis* Tharp, Myc. **9**: 108. 1917.
57. *C. biformis* Peck, Torr. Bot. Club Bull. **36**: 156. 1909; Syll. Fung. **22**: 1414. 1913.
58. *C. bliti* Tharp, Myc. **9**: 108. 1917; *l. c.* **16**: 139. 1924.
59. *C. Bloxami* Berk. & Br. Ann. Mag. Nat. Hist. V, **9**: 183. 1882; Syll. Fung. **4**: 433. 1886; B. P. I. Bull. 226: 38. 1912.
60. *C. Boehmeriae* Peck, N. Y. Mus. Rept. **34**: 48. 1881; Syll. Fung. **4**: 457. 1886; Jour. Myc. **1**: 37. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 54. 1892; Myc. **18**: 31. 1926.
61. *C. Bolleana* (Thuem.) Speg. Michelia **1**: 475. 1879; Oest. Bot. Zeitschr. **27**: 12. 1877, as *Septosporium Bolleanum* Thuem.; Syll. Fung. **4**: 475. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 61. 1892.
62. *C. Borreriae* Ell. & Ev. Acad. Phila. Proc. **1894**: 379. 1894; Syll. Fung. **11**: 627. 1895.
63. *C. brachiata* Ell. & Ev. Jour. Myc. **4**: 5. 1888; Syll. Fung. **10**: 637. 1892; B. P. I. Bull. 226: 99. 1912.
64. *C. brachypoda* Speg. Anal. Soc. Cient. Arg. **13**: 28. 1882; Syll. Fung. **4**: 441. 1886; U. S. D. A. Bull. 1366. 1926.
65. *C. brachypus* Ell. & Ev. Jour. Myc. **8**: 71. 1902; Syll. Fung. **18**: 598. 1906.
66. *C. Briareus* Ell. & Ev. Acad. Phila. Proc. **1894**: 381. 1894; Syll. Fung. **11**: 629. 1895.
67. *C. Brunkii* Ell. & Gall. Jour. Myc. **6**: 33. 1890; Syll. Fung. **10**: 620. 1892.
68. *C. brunnea* Peck, Torr. Bot. Club Bull. **36**: 156. 1909; Syll. Fung. **22**: 1427. 1913; Wisc. Acad. Trans. **21**: 289. 1924.
69. *C. caespitosa* Ell. & Ev. Acad. Phila. Proc. **1891**: 88. 1891; Syll. Fung. **10**: 657. 1892.
70. *C. Callae* Peck & Clint. N. Y. Mus. Rept. **29**: 52. 1878; Syll. Fung. **4**: 478. 1886; Jour. Myc. **1**: 22. 1885; *l. c.* **4**: 6. 1888; Wisc. Acad. Trans. **14**: 95. 1903; *l. c.* **20**: 400. 1922.
71. *C. Callicarpae* Cooke, Grev. **6**: 140. 1878; Syll. Fung. **4**: 470. 1886; Jour. Myc. **1**: 50. 1885; Iowa Acad. Proc. **7**: 162. 1899.
72. *C. Camptosori* Davis, Wisc. Acad. Trans. **18**: 267. 1915.
73. *C. canescens* Ell. & Mart. Am. Nat. **16**: 1003. 1882; Syll. Fung. **4**: 435. 1886; Jour. Myc. **1**: 21. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 48. 1892; Tuskegee Sta. Bull. **4**: 5. 1904; Jour. Myc. **8**: 73. 1902; N. J. Agr. Sta. Bull. 313: 132. 1917; B. P. I. Bull. 226: 37. 1912.
74. *C. capitati* Tharp, Myc. **9**: 108. 1917.
75. *C. capreolata* Ell. & Ev. Jour. Myc. **8**: 70. 1902; Syll. Fung. **18**: 604. 1906.
76. *C. Capsici* Heald & Wolf, Myc. **3**: 15. 1911; B. P. I. Bull. 226: 42. 1912.
77. *C. Caricina* Ell. & Dearn. Can. Inst. Proc. **1**: 91. 1897; Syll. Fung. **14**: 1105. 1899; Wisc. Acad. Trans. **14**: 96. 1903; *l. c.* **16**: 751. 1909; *l. c.* **17**: 890. 1914; *l. c.* **18**: 86, 100. 1915; *l. c.* **21**: 253, 294. 1924.

78. *C. Caricis* Dearn. & House, N. Y. Mus. Bull. 188: 29. 1916.
79. *C. carolinensis* Tharp, Myc. **9**: 109. 1917.
80. *C. Carveriana* Sacc. & D. Sacc. Syll. Fung. **18**: 607. 1906; Jour. Myc. **8**: 72. June 30, 1902, as *C. Richardsoniae* Ell. & Ev., not *C. Richardsoniae* P. Henn. Hedw. **41**: 117. June 23, 1902.
81. *C. Cassavae*[1] Ell. & Ev. Torr. Bot. Club Bull. **22**: 438. 1895; Syll. Fung. **14**: 1104. 1899.
82. *C. Catalpae* Wint. Hedw. **24**: 203. 1885; Syll. Fung. **4**: 470. 1886; Jour. Myc. **1**: 124. 1885; Tex. Agr. Sta. Bull. **9**: 24. 1890; B. P. I. Bull. 226: 62. 1912.
83. *C. catenospora* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 66. 1892; Syll. Fung. **10**: 645. 1892; B. P. I. Bull. 226: 65. 1912.
84. *C. caulicola* Wint. Hedw. **24**: 203. 1885; Syll. Fung. **4**: 477. 1886; Jour. Myc. **1**: 125. 1885.
85. *C. Caulophylli* Peck, N. Y. Mus. Rept. **33**: 30. 1880; Syll. Fung. **4**: 433. 1886; Jour. Myc. **1**: 39. 1885; *l. c.* **9**: 171. 1903.
86. *C. Ceanothi* Kell. & Sw. Jour. Myc. **4**: 94. 1888; Syll. Fung. **10**: 646. 1892.
87. *C. Cephalanthi* Ell. & Kell. Torr. Bot. Club Bull. **11**: 121. 1884; Syll. Fung. **4**: 466. 1886; *l. c.* **10**: 645. 1892; Jour. Myc. **1**: 22. 1885; *l. c.* **4**: 5. 1888; Elisha Mitchell Sci. Soc. Jour. **8**: 67. 1892.
88. *C. Cerasella* Sacc. Michelia **1**: 266. 1878; Syll. Fung. **4**: 460. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 41. 1892.
89. *C. cercidicola* Ell. Am. Nat. **16**: 810. 1882; Syll. Fung. **4**: 463. 1886; Jour. Myc. **1**: 36. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 42. 1892; B. P. I. Bull. 226: 77. 1912; N. J. Agr. Sta. Bull. 313: 132. 1917.
90. *C. cercidicola* Ell. var. *coremioides* Tehon, Myc. **16**: 140. 1924.
91. *C. Chamaecristae* Ell. & Kell. Jour. Myc. **4**: 7. 1888; Syll. Fung. **10**: 641. 1892.
92. *C. Chionanthi* Ell. & Ev. Field Mus. Bot. Ser. Rept. **1**: 94. 1896; Syll. Fung. **14**: 1103. 1899; N. J. Agr. Sta. Bull. 313: 132. 1917.
93. *C. Chrysanthemi* Heald & Wolf, Myc. **3**: 15. 1911; B. P. I. Bull. 226: 85. 1912.
94. *C. Chrysobalani* Ell. & Ev. Torr. Bot. Club Bull. **22**: 438. 1895; Syll. Fung. **14**: 1101. 1899.
95. *C. Cichorii* Davis, Wisc. Acad. Trans. **19**: 715. 1919.
96. *C. Cinchonae* Ell. & Ev. Jour. Myc. **3**: 17. 1887; Syll. Fung. **10**: 645. 1892.
97. *C. circumscissa* Sacc. Nuovo Giorn. Bot. Ital. **8**: 189. 1876; Hedw. **24**: 203. 1885, as *C. graphioides* Ell.; Syll. Fung. **4**: 460. 1886; Jour. Myc. **1**: 23. 1885; *l. c.* **7**: 66–77. 1892; N. J. Agr. Sta. Bull. 313: 134. 1917; Wisc. Acad. Trans. **19**: 694. 1919.
98. *C. Cirsii* Ell. & Ev. Acad. Phila. Proc. **1894**: 379. 1894; Syll. Fung. **11**: 628. 1895.
99. *C. Citrullina* Cooke, Grev. **12**: 31. 1883; Syll. Fung. **4**: 452. 1886; Jour. Myc. **1**: 20. 1885; B. P. I. Bull. 226: 45. 1912; N. J. Agr. Sta. Bull. 313: 132. 1917.

[1] E. W. Mason in 'Annotated Account of Fungi Received at the Imperial Bureau of Mycology,' Kew, Dec. 31, 1928, makes *C. Cassavae* Ell. & Ev. and *C. manihotis* P. Henn. synonyms of *C. Henningsii* Allesch.

100. *C. clavata* (Ger.) Peck, N. Y. Mus. Rept. **34**: 48. 1881; Torr. Bot. Club Bull. **5**: 27. 1874, as *Helminthosporium clavatum* Ger.; Syll. Fung. **4**: 451. 1886; Jour. Myc. **1**: 54. 1885; *l. c.* **4**: 28. 1888; Wisc. Acad. Trans. **9**: 166. 1893; *l. c.* **17**: 893. 1914; *l. c.* **20**: 416. 1922; *l. c.* **21**: 294. 1924; Myc. **7**: 41. 1915; N. J. Agr. Sta. Bull. 313: 134. 1917.
101. *C. clavicarpa* Ell. & Ev. Erythea **2**: 26. 1894; Syll. Fung. **11**: 628. 1895.
102. *C. Cleomis* Ell. & Halst. Jour. Myc. **6**: 34. 1890; Syll. Fung. **10**: 621. 1892.
103. *C. Clitoriae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 62. 1892; Syll. Fung. **10**: 641. 1892; Iowa Acad. Proc. **7**: 162. 1899.
104. *C. coalescens* Davis, Wisc. Acad. Trans. **15**: 780. 1907.
105. *C. coffeicola* Berk. & Curt. Grev. **9**: 99. 1881; Syll. Fung. **4**: 472. 1886; Jour. Myc. **4**: 5. 1888; Syll. Fung. **10**: 645. 1892.
106. *C. Coleosanthi* Ell. & Ev. Torr. Bot. Club Bull. **24**: 474. 1897; Syll. Fung. **14**: 1102. 1899.
107. *C. Coleroides* Sacc. Jour. Myc. **12**: 252. 1906; Syll. Fung. **22**: 1416. 1913.
108. *C. columbiensis* Ell. & Ev. Jour. Myc. **3**: 15. 1887; Syll. Fung. **10**: 619. 1892.
109. *C. columnaris*[1] Ell. & Ev. Acad. Phila. Proc. **1894**: 380. 1894; Syll. Fung. **11**: 625. 1895.
110. *C. Comandrae* Ell. & Dearn. Acad. Phila. Proc. **1891**: 90. 1891; Syll. Fung. **10**: 637. 1892; Wisc. Acad. Trans. **18**: 267. 1915.
111. *C. Comari* Peck, N. Y. Mus. Rept. **38**: 101. 1885; Syll. Fung. **4**: 440. 1886; Jour. Myc. **1**: 63. 1885.
112. *C. Commonsii* Sacc. Syll. Fung. **10**: 623. 1892; Jour. Myc. **3**: 13. 1887, as *C. Stylosanthis* Ell. & Ev., not *C. Stylosanthis* Speg. Guar. **1**: 169. 1886.
113. *C. concentrica* Cooke & Ell. Grev. **5**: 90. 1877; *l. c.* **7**: 35. 1878, as *C. Yuccae* Cooke; Syll. Fung. **4**: 479. 1886; Jour. Myc. **1**: 23. 1885, as *C. Yuccae* Cooke.
114. *C. concors* (Casp.) Sacc. Syll. Fung. **4**: 449. 1886; K. Akad. Wiss. Berlin Monatsber. **1855**: 314. 1855, as *Fusisporium concors* Casp.
115. *C. condensata* Ell. & Kell. Jour. Myc. **1**: 2. 1885; Syll. Fung. **4**: 438, 462. 1886; Jour. Myc. **2**: 2. 1886; Wisc. Acad. Trans. **18**: 267. 1915.
116. *C. confluens* Lieneman, nom. nov.
(*C. Crataegi* Heald & Wolf, Myc. **3**: 16. 1911, not *C. Crataegi* Sacc. & Massal. Ann. Myc. **3**: 515. 1905; B. P. I. Bull. 226: 70. 1912.)
117. *C. consobrina* Ell. & Ev. Jour. Myc. **3**: 19. 1887; Syll. Fung. **10**: 643. 1892.
118. *C. consociata* Wint. Hedw. **22**: 70. 1883; Syll. Fung. **4**: 470. 1886; Jour. Myc. **1**: 53. 1885; Ala. Agr. Sta. Bull. 80: 144. 1897; Iowa Acad. Proc. **7**: 163. 1899.
119. *C. conspicua* Earle, N. Y. Bot. Gard. Bull. **3**: 312. 1905; Syll. Fung. **18**: 596. 1906.
120. *C. Convolvuli* Tracy & Earle, Torr. Bot. Club Bull. **28**: 187. 1901; Syll. Fung. **18**: 605. 1906.
121. *C. Corni* Davis, Wisc. Acad. Trans. **18**: 268. 1915; *l. c.* **19**: 675. 1919.
122. *C. cornicola* Tracy & Earle, Torr. Bot. Club Bull. **23**: 205. 1896; Syll. Fung. **14**: 1101. 1899; B. P. I. Bull. 226: 65. 1912.
123. *C. crassa* Sacc. Michelia **1**: 88. 1877; Syll. Fung. **4**: 448. 1886; Wisc. Acad. Trans. **19**: 689. 1919, as *Alternaria crassa* (Sacc.) Rands.

[1] Dr. L. O. Overholts, in an article now in manuscript, shows *C. columnaris* Ell. and Ev. to be synonymous with *Isariopsis griseola* Sacc.

124. *C. crassoides* Davis, Wisc. Acad. Trans. **21**: 298. 1924.
125. *C. crinospora* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 58. 1892; Syll. Fung. **10**: 655. 1892.
126. *C. crotonicola* Ell. & Barth. Jour. Myc. **8**: 177. 1902; Syll. Fung. **18**: 602. 1906.
127. *C. crotonifolia* Cooke, Grev. **12**: 31. 1883; Syll. Fung. **4**: 473. 1886; Jour. Myc. **1**: 21. 1885.
128. *C. Crotonis* Ell. & Ev. Acad. Phila. Proc. **1893**: 170. 1893; Syll. Fung. **11**: 629. 1895.
129. *C. Cruciferarum* Ell. & Ev. Jour. Myc. **3**: 17. 1887; Syll. Fung. **10**: 619. 1892.
130. *C. cruenta* Sacc. Michelia **2**: 149. 1880; Syll. Fung. **4**: 435. 1886; Jour. Myc. **2**: 1. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 56. 1892; B. P. I. Bull. 226: 49. 1912; N. J. Agr. Sta. Bull. 313: 134. 1917.
131. *C. Cucurbitae* Ell. & Ev. Jour. Myc. **4**: 3. 1888; Syll. Fung. **10**: 634. 1892; Jour. Myc. **4**: 28. 1888; Elisha Mitchell Sci. Soc. Jour. **8**: 45. 1892; B. P. I. Bull. 226: 43, 105. 1912.
132. *C. Cydoniae* Ell. & Ev. Jour. Myc. **8**: 72. 1902; Syll. Fung. **18**: 601. 1906.
133. *C. Cypripedii* Ell. & Dearn. Can. Inst. Trans. **6**: 637. 1899; Syll. Fung. **16**: 1073. 1902; Wisc. Acad. Trans. **16**: 758. 1909; *l. c.* **17**: 891. 1914.
134. *C. Daleae* Ell. & Kell. Jour. Myc. **4**: 6. 1888; Syll. Fung. **10**: 622. 1892.
135. *C. Daturae* Peck, N. Y. Mus. Rept. **35**: 140. 1884; Syll. Fung. **4**: 449. 1886; Jour. Myc. **1**: 62. 1885; Wisc. Acad. Trans. **19**: 689. 1919.
136. *C. Davisii* Ell. & Ev. Acad. Phila. Proc. **1891**: 89. 1891; Syll. Fung. **10**: 622. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 60. 1892; Myc. **1**: 268. 1909; Wisc. Acad. Trans. **9**: 166. 1893; *l. c.* **21**: 275. 1924.
137. *C. Decodontis* Tehon & Daniels, Myc. **17**: 246. 1925.
138. *C. Decumariae* Tracy & Earle, Torr. Bot. Club Bull. **26**: 495. 1899; Syll. Fung. **16**: 1067. 1902.
139. *C. Demetrioniana* Wint. Hedw. **23**: 170. 1884; Syll. Fung. **4**: 439. 1886; Jour. Myc. **1**: 34. 1885.
140. *C. Depazeoides* (Desm.) Sacc. Nuovo Giorn. Bot. Ital. **8**: 187. 1876; Am. Nat. **17**: 1166. 1883, as *C. Sambucina* Ell. & Kell.; Ann. Sci. Nat. Bot. III, **11**: 364. 1849, as *Exosporium Depazeoides* Desm.; Syll. Fung. **4**: 469. 1886; Jour. Myc. **1**: 34. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 61. 1892; Wisc. Acad. Trans. **19**: 688. 1919; Ind. Acad. Proc. **1921**: 146. 1922.
141. *C. Desmanthi* Ell. & Kell. Jour. Myc. **3**: 14. 1887; *l. c.* **1**: 2. 1885, as *C. condensata* var. *Desmanthi* Ell. & Kell.; Syll. Fung. **4**: 462. 1886, as *C. condensata* var. *Desmanthi* Ell. & Kell.; *l. c.* **10**: 641. 1892.
142. *C. Desmodii* Ell. & Kell. Torr. Bot. Club Bull. **11**: 121. 1884; Syll. Fung. **4**: 439. 1886; Jour. Myc. **1**: 50. 1885; Hedw. **24**: 204. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 53. 1892.
143. *C. destructiva* Rav. in Ell. & Ev. Jour. Myc. **3**: 13. 1887; Syll. Fung. **10**: 642. 1892.
144. *C. Deutziae* Ell. & Ev. Jour. Myc. **4**: 5. 1888; Syll. Fung. **10**: 642. 1892.
145. *C. Diantherae* Ell. & Kell. Jour. Myc. **1**: 2, 19. 1885; Syll. Fung. **4**: 448. 1886; B. P. I. Bull. 226: 104. 1912.
146. *C. didymospora* Ell. & Barth. Erythea **4**: 28. 1896; Syll. Fung. **14**: 1100. 1899.

147. *C. Diervillae* Ell. & Ev. Univ. Maine Studies **3**: 22. 1902; Syll. Fung. **18**: 605. 1906.
148. *C. diffusa* Ell. & Ev. Jour. Myc. **4**: 3. 1888; Syll. Fung. **10**: 635. 1892; Wisc. Acad. Trans. **21**: 278. 1924.
149. *C. Diodiae* Cooke, Grev. **7**: 34. 1878; Syll. Fung. **4**: 441. 1886; Michelia **2**: 148. 1880; Jour. Myc. **1**: 35. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 44. 1892; N. J. Agr. Sta. Bull. 313: 134. 1917.
150. *C. Diodiae-virginianae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 58. 1892; Syll. Fung. **10**: 645. 1892.
151. *C. Dioscoreae* Ell. & Mart. Am. Nat. **16**: 1003. 1882; Syll. Fung. **4**: 479. 1886; Jour. Myc. **1**: 54. 1885.
152. *C. Diospyri* Thuem. Myc. Univ. 1273. 1879[1]; Syll. Fung. **4**: 467. 1886; Grev. **12**: 31. 1883; Jour. Myc. **1**: 51. 1885.
153. *C. Diospyri* Thuem. var. *ferruginosa* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 63. 1892.
154. *C. dispersa* Ell. & Ev. Jour. Myc. **4**: 115. 1888; Syll. Fung. **10**: 652. 1892.
155. *C. ditissima* Ell. & Ev. Acad. Phila. Proc. **1893**: 171. 1893; Syll. Fung. **11**: 628. 1895.
156. *C. Dolichi* Ell. & Ev. Jour. Myc. **5**: 71. 1889; Syll. Fung. **10**: 622. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 62. 1892; N. J. Agr. Sta. Bull. 313: 134. 1917.
157. *C. dubia* (Riess) Wint. Hedw. **22**: 10. 1883; *l. c.* **1**: *t. 4*, *f. 9.* 1854, as *Ramularia dubia* Riess, not Speg.; Syll. Fung. **4**: 456. 1886; Beitr. Myk. 92. 1863, as *C. Chenopodii* Fres.; Michelia **2**: 364. 1881; Jour. Myc. **1**: 19. 1885; N. J. Agr. Sta. Bull. 313: 134. 1917; Wisc. Acad. Trans. **17**: 890. 1914.
158. *C. Dulcamarae* (Peck) Ell. Jour. Myc. **1**: 55. 1885; N. Y. Mus. Rept. **33**: 30. 1880, as *Ramularia Dulcamarae* Peck; Syll. Fung. **4**: 449. 1886.
159. *C. duplicata* Ell. & Ev. Jour. Myc. **5**: 70. 1889; Syll. Fung. **10**: 648. 1892.
160. *C. Echinochloae* Davis, Wisc. Acad. Trans. **18**: 106. 1915.
161. *C. Echinocystis* Ell. & Mart. Am. Nat. **16**: 1003. 1882; Syll. Fung. **4**: 452. 1886; Jour. Myc. **1**: 40. 1885; Wisc. Acad. Trans. **15**: 268. 1915; Myc. **16**: 138. 1924.
162. *C. effusa* (Berk. & Curt.) Ell. Jour. Myc. **1**: 53. 1885; Grev. **3**: 106. 1875, as *Cladosporium effusum* Berk. & Curt.; Syll. Fung. **4**: 447. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 62. 1892.
163. *C. Elaeagni* Heald & Wolf, Myc. **3**: 16. 1911; B. P. I. Bull. 226: 75. 1912.
164. *C. elaeochroma* Sacc. Nuovo Giorn. Bot. Ital. **23**: 220. 1916.
165. *C. Elephantopodis* Ell. & Ev. Jour. Myc. **3**: 15. 1887; Syll. Fung. **10**: 626. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 55. 1892; Iowa Acad. Proc. **7**: 163. 1899.
166. *C. Ellisii* Sacc. & Syd. Syll. Fung. **14**: 1103. 1899; Erythea **5**: 5. 1897, as *C. Hyptidis* Ell. & Ev., not Speg.
167. *C. elongata* Peck, N. Y. Mus. Rept. **33**: 29. 1880; Syll. Fung. **4**: 442. 1886; Syll. Fung. **10**: 629. 1892; Jour. Myc. **1**: 38. 1885; *l. c.* **8**: 121. 1902.

[1] There is no indication in the copy of 'Mycotheca Universalis' at the Missouri Botanical Garden that the present label designating this species as *Cercospora* is an emended label substituted for one designating it as *Helminthosporium*, as would be inferred from 'Sylloge Fungorum' and 'Grevillea.'

168. *C. Epigaeae* Ell. & Dearn. Can. Inst. Trans. **6**: 637. 1899; Syll. Fung. **16**: 1071. 1902.
169. *C. Epigaeina*[1] Davis, Wisc. Acad. Trans. **16**: 758. 1909; Syll. Fung. **22**: 1425. 1913.
170. *C. Epilobii* Schn. Michelia **2**: 642. 1882; Syll. Fung. **4**: 453. 1886; Jour. Myc. **1**: 51. 1885.
171. *C. Erechthitis* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 66. 1892; Syll. Fung. **10**: 629. 1892.
172. *C. Eriogoni* Ell. & Ev. Erythea **5**: 6. 1897; Syll. Fung. **14**: 1105. 1899.
173. *C. Erysimi* Davis, Wisc. Acad. Trans. **18**: 267. 1915.
174. *C. Erythrinae* Ell. & Ev. Jour. Myc. **3**: 18. 1887; Syll. Fung. **10**: 640. 1892.
175. *C. erythrinicola* Tharp, Myc. **9**: 109. 1917.
176. *C. erythrogena* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 65. 1892; Syll. Fung. **10**: 644. 1892.
177. *C. Euonymi* Ell. Am. Nat. **16**: 810. 1882; Syll. Fung. **4**: 466. 1886; Jour. Myc. **1**: 19. 1885; Wisc. Acad. Trans. **21**: 262. 1924.
178. *C. Eupatorii* Peck, N. Y. Mus. Rept. **33**: 29. 1880; Syll. Fung. **4**: 444. 1886; Jour. Myc. **1**: 35. 1885; Iowa Acad. Proc. **7**: 163. 1899.
179. *C. Euphorbiae* Kell. & Sw. Jour. Myc. **5**: 76. 1889, not *C. Euphorbiae* Pat. Soc. Myc. Fr. Bull. **9**: 160. 1893.
180. *C. euphorbiaecola* Atk. Cornell Univ. Bull. **3**[1]: 41. 1897; Syll. Fung. **14**: 1104. 1899.
181. *C. euphorbiaecola* Atk. var. *tragiae* Tharp, Myc. **9**: 109. 1917.
182. *C. Eustomae* Peck, N. Y. Mus. Bull. 157: 45, 107. 1912.
183. *C. exotica* Ell. & Ev. Acad. Phila. Proc. **1893**: 463. 1893; Syll. Fung. **11**: 625. 1895.
184. *C. ferruginea* Fckl. Beitr. Myk. 93. 1863; Syll. Fung. **4**: 444. 1886; Symb. Myc. 354. 1869–70; Jour. Myc. **2**: 1. 1886; *l. c.* **5**: 143. 1889.
185. *C. Fici* Heald & Wolf, Myc. **3**: 16. 1911; B. P. I. Bull. 226: 26. 1912.
186. *C. Ficina* Tharp, Myc. **9**: 109. 1917.
187. *C. filispora* Peck, Jour. Myc. **1**: 36. 1885; Syll. Fung. **4**: 436. 1886.
188. *C. fingens* Davis, Wisc. Acad. Trans. **18**: 92. 1915.
189. *C. flagellaris* Ell. & Mart. Am. Nat. **16**: 1003. 1882; Syll. Fung. **4**: 453. 1886; Jour. Myc. **1**: 18. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 46. 1892; B. P. I. Bull. 226: 99, 101. 1912.
190. *C. flagellifera* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 51. 1892; Syll. Fung. **10**: 622. 1892; Wisc. Acad. Trans. **20**: 429. 1922; *l. c.* **21**: 258. 1924.
191. *C. flagelliformis* Ell. & Halst. N. J. Agr. Sta. Rept. **11**: 355. 1890, nomen nudum; U. S. D. A. Bull. 1366. 1926.
192. *C. flexuosa* Tracy & Earle, Torr. Bot. Club Bull. **22**: 178. 1895; Syll. Fung. **14**: 1101. 1899.
193. *C. floricola* Heald & Wolf, Myc. **3**: 17. 1911; B. P. I. Bull. 226: 106. 1912.
194. *C. Fraxinea* Ell. & Ev. Jour. Myc. **4**: 4. 1888; Syll. Fung. **10**: 646. 1892.
195. *C. Fraxinites* Ell. & Ev. Jour. Myc. **3**: 20. 1887; Syll. Fung. **10**: 647. 1892; B. P. I. Bull. 226: 57. 1912.
196. *C. fuliginosa* Ell. & Kell. Jour. Myc. **3**: 103. 1887, as *C. fuligniosa;* Syll. Fung. **10**: 648. 1892; B. P. I. Bull. 226: 30. 1912.

[1] J. J. Davis in Wisc. Acad. Trans. **21**: 275. 1924, says: " . . . evidently not distinct from *C. Epigaeae* Ell. & Dearn. which is the older name."

197. *C. fulvella* Heald & Wolf, Myc. **3:** 17. 1911; B. P. I. Bull. 226: 93. 1912.
198. *C. fuscovirens* Sacc. Michelia **2:** 149. 1880; Syll. Fung. **4:** 452. 1886; Jour. Myc. **1:** 53. 1885; *l. c.* **5:** 72. 1889; Elisha Mitchell Sci. Soc. Jour. **8:** 63. 1892.
199. *C. fusimaculans* Atk. Elisha Mitchell Sci. Soc. Jour. **8:** 50. 1892; Syll. Fung. **10:** 655. 1892; Myc. **14:** 198. 1922.
200. *C. Galactiae* Ell. & Ev. Torr. Bot. Club Bull. **22:** 438. 1895; Syll. Fung. **14:** 1100. 1899.
201. *C. Galii* Ell. & Holw. Jour. Myc. **1:** 5. 1885; Syll. Fung. **4:** 441. 1886; Jour. Myc. **1:** 39. 1885; *l. c.* **3:** 16. 1887; Elisha Mitchell Sci. Soc. Jour. **8:** 53. 1892; Wisc. Acad. Trans. **17:** 894. 1914; *l. c.* **20:** 405. 1922; *l. c.* **21.** 289. 1924.
202. *C. Garryae* Harkn. Calif. Acad. Bull. **1:** 38. 1884; Syll. Fung. **4:** 474. 1886; Jour. Myc. **1:** 39. 1885.
203. *C. Gaultheriae* Ell. & Ev. Jour. Myc. **2:** 2. 1886; Syll. Fung. **4:** 472. 1886.
204. *C. Gaurae* Kell. & Sw. Jour. Myc. **5:** 75. 1889; Syll. Fung. **10:** 625. 1892.
205. *C. Gayophyti* Ell. & Ev. Torr. Bot. Club Bull. **24:** 474. 1897; Syll. Fung. **14:** 1100. 1899.
206. *C. Gentianae* Peck, N. Y. Mus. Rept. **41:** 80. 1888; Syll. Fung. **10:** 634. 1892.
207. *C. gentianicola* Ell. & Ev. Jour. Myc. **4:** 2. 1888; Syll. Fung. **10:** 633. 1892; Wisc. Acad. Trans. **19:** 688. 1919.
208. *C. Geranii* Kell. & Sw. Jour. Myc. **5:** 74. 1889; Syll. Fung. **10:** 621. 1892; Wisc. Acad. Trans. **11:** 171. 1897; *l. c.* **17:** 892. 1914.
209. *C. Gerardiae* Ell. & Dearn. Can. Rec. Sci. **5:** 271. 1893; Syll. Fung. **11:** 628. 1895; Wisc. Acad. Trans. **14:** 96. 1903; *l. c.* **17:** 894. 1914.
210. *C. glandulosa* Ell. & Kell. Jour. Myc. **1:** 3. 1885; Syll. Fung. **4:** 467. 1886; Jour. Myc. **4:** 28. 1888; B. P. I. Bull. 226: 79. 1912.
211. *C. glomerata* Harkn. Calif. Acad. Bull. **3:** 164. 1885; Syll. Fung. **4:** 472. 1886; Jour. Myc. **1:** 106. 1885.
212. *C. glotidiicola* Tracy & Earle, Torr. Bot. Club Bull. **23:** 206. 1896; Syll. Fung. **14:** 1100. 1899.
213. *C. Gnaphaliacea* Cooke, N. Y. Acad. Ann. **1:** 182. 1878; Syll. Fung. **4:** 444. 1886; Linn. Soc. Bot. Jour. **17:** 142. 1880; Jour. Myc. **2:** 1. 1886; Torr. Bot. Club Bull. **25:** 366. 1898; Wisc. Acad. Trans. **14:** 96. 1903; *l. c.* **17:** 894. 1914.
214. *C. Gnaphalii* Harkn. Calif. Acad. Bull. **1:** 38. 1884; Syll. Fung. **4:** 444. 1886; Jour. Myc. **1:** 49. 1885.
215. *C. Gossypina* Cooke, Grev. **12:** 31. 1883; Syll. Fung. **4:** 441. 1886; Jour. Myc. **1:** 49. 1885; Elisha Mitchell Sci. Soc. Jour. **8:** 66. 1892; B. P. I. Bull. 226: 55. 1912.
216. *C. graminicola* Tracy & Earle, Torr. Bot. Club Bull. **22:** 179. 1895; Syll. Fung. **14:** 1106. 1899.
217. *C. granuliformis* Ell. & Holw. Jour. Myc. **1:** 6. 1885; Syll. Fung. **4:** 434. 1886; Jour. Myc. **1:** 40. 1885; N. J. Agr. Sta. Bull. 313: 136. 1917; Ind. Acad. Proc. **1921:** 147. 1922; Wisc. Acad. Trans. **21:** 294. 1924.
218. *C. Gratiolae* Ell. & Ev. Jour. Myc. **8:** 71. 1902; Syll. Fung. **18:** 604. 1906.
219. *C. Grindeliae* Ell. & Ev. Acad. Phila. Proc. **1895:** 439. 1896; Syll. Fung. **14:** 1101. 1899; Wisc. Acad. Trans. **18:** 269. 1915.

220. *C. grisea* Cooke & Ell. Grev. **5**: 49. 1876; Syll. Fung. **4**: 434. 1886, as *C. minuta* Cooke & Ell., probably an error for *C. grisea* Cooke & Ell.; Grev. **6**: 89. 1878; Jour. Myc. **1**: 53. 1885.
221. *C. grisella* Peck, N. Y. Mus. Rept. **33**: 29. 1880; Syll. Fung. **4**: 443. 1886; Jour. Myc. **1**: 62. 1885.
222. *C. guttulata* Ell. & Kell. Jour. Myc. **9**: 105. 1903; Syll. Fung. **18**: 608. 1906.
223. *C. Gymnocladi* Ell. & Kell. Torr. Bot. Club Bull. **11**: 121. 1884; Syll. Fung. **4**: 464. 1886; Jour. Myc. **1**: 23. 1885.
224. *C. Halstedii* Ell. & Ev. Acad. Phila. Proc. **1891**: 90. 1891; Syll. Fung. **10**: 651. 1892.
225. *C. Hanseni* Ell. & Ev. Erythea **1**: 147. 1893; Syll. Fung. **11**: 629. 1895.
226. *C. Helenii* Tharp, Myc. **9**: 110. 1917.
227. *C. Helianthi* Ell. & Ev. Jour. Myc. **3**: 20. 1887; Syll. Fung. **10**: 628. 1892; Jour. Myc. **4**: 6, 28. 1888; *l. c.* **10**: 56. 1904; Wisc. Acad. Trans. **20**: 422. 1922.
228. *C. Heliotropii* Ell. & Ev. Jour. Myc. **4**: 5. 1888; Syll. Fung. **10**: 630. 1892.
229. *C. helvola* Sacc. Michelia **2**: 556. 1882; Syll. Fung. **4**: 437. 1886; Jour. Myc. **4**: 7. 1888.
230. *C. helvola* Sacc. var. *Medicaginis*[1] Chester, according to Jour. Myc. **6**: 81. 1890.
231. *C. Hemerocallis* Tehon, Myc. **16**: 139. 1924.
232. *C. Herrerana* Farneti, Bot. Univ. Pavia Atti, II, **9**: 37. 1904; Syll. Fung. **18**: 606. 1906.
233. *C. Heteromeles* Harkn. Calif. Acad. Bull. **1**: 38. 1884; Syll. Fung. **4**: 461. 1886; Jour. Myc. **1**: 24. 1885.
234. *C. heterospora* Ell. & Ev. Torr. Bot. Club Bull. **25**: 512. 1898; Syll. Fung. **16**: 1072. 1902.
235. *C. Heucherae* Ell. & Mart. Am. Nat. **18**: 189. 1884; Syll. Fung. **4**: 453. 1886; Jour. Myc. **1**: 34. 1885.
236. *C. Hibisci* Tracy & Earle, Torr. Bot. Club Bull. **22**: 179. 1895; Syll. Fung. **14**: 1099. 1899.
237. *C. Hibiscina* Ell. & Ev. Acad. Phila. Proc. **1895**: 438. 1896; Syll. Fung. **14**: 1099. 1899.
238. *C. Hieracii* Ell. & Ev. Jour. Myc. **8**: 70. 1902; Syll. Fung. **18**: 607. 1906.
239. *C. Houstoniae* Ell. & Ev. Acad. Phila. Proc. **1891**: 89. 1891; Syll. Fung. **10**: 634. 1892.
240. *C. Hydrangeae* Ell. & Ev. in Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 52. 1892; Syll. Fung. **18**: 602. 1906; Jour. Myc. **8**: 71. 1902.
241. *C. Hydrangeana* Tharp, Myc. **9**: 110. 1917.
242. *C. Hydrocotyles* Ell. & Ev. Jour. Myc. **3**: 16. 1887; Syll. Fung. **10**: 624. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 55. 1892; Iowa Acad. Proc. **7**: 164. 1899; B. P. I. Bull. 226: 96. 1912.
243. *C. Hydropiperis* (Thuem.) Speg. Soc. Cien. Argent. Anal. **1**: 191. 1867;[2] Myc. Univ. 1087, as *Helminthosporium Hydropiperis* Thuem.; Syll. Fung. **4**: 455. 1886; Hedw. **17**: 39. 1878, as *C. polygonorum* Cooke; Jour. Myc. **1**: 52. 1885, as *C. polygonorum* Cooke; *l. c.* **8**: 58. 1902; Myc. **8**: 43. 1916.

[1] Delaware Agr. Sta. Rept. **2**: 94–97. 1890, which is given as the original citation, does not appear to contain the description.

[2] It has been impossible to verify this citation.

244. *C. Hyperici* Tehon & Daniels, Myc. **19**: 127. 1927.
245. *C. Ichthyomethiae* Dearn. & Barth. Myc. **16**: 175. 1924.
246. *C. ilicicola* Lieneman, nom. nov.
(*C. Ilicis* Maublanc, Algunos fungos do Brazil [other data unknown], not *C. Ilicis* Ell. Torr. Bot. Club Bull. **8**: 65. 1881; Myc. **9**: 110. 1917.)
247. *C. Ilicis* Ell. Torr. Bot. Club Bull. **8**: 65. 1881; Syll. Fung. **4**: 467. 1886; Jour. Myc. **1**: 24. 1885; N. J. Agr. Sta. Bull. 313: 136. 1917.
248. *C. illinoensis* Barth. Fungi Columb. 2611. 1908; Syll. Fung. **22**: 1428. 1913.
249. *C. incarnata* Ell. & Ev. Torr. Bot. Club Bull. **24**: 474. 1897; Syll. Fung. **14**: 1103. 1899.
250. *C. infuscans* Ell. & Ev. Acad. Phila. Proc. **1891**: 90. 1891; Syll. Fung. **10**: 639. 1892.
251. *C. inquinans* Cooke, Grev. **7**: 12. 1878; Syll. Fung. **4**: 465. 1886; Jour. Myc. **1**: 36. 1885.
252. *C. Ipomoeae* Wint. Hedw. **26**: 34. 1887; Syll. Fung. **10**: 633. 1892; Jour. Myc. **4**: 7. 1888.
253. *C. Isanthi* Ell. & Kell. Torr. Bot. Club Bull. **11**: 115. 1884; Syll. Fung. **4**: 447. 1886; Jour. Myc. **1**: 21. 1885.
254. *C. Jatrophae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 64. 1892; Syll. Fung. **10**: 650. 1892.
255. *C. Juglandis* Kell. & Sw. Jour. Myc. **5**: 77. 1889; Syll. Fung. **10**: 651. 1892.
256. *C. Jussieuae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 50. 1892; Syll. Fung. **10**: 625. 1892.
257. *C. Kaki* Ell. & Ev. Jour. Myc. **3**: 17. 1887; Syll. Fung. **10**: 648. 1892; B. P. I. Bull. 226: 31. 1912.
258. *C. Kalmiae* Ell. & Ev. Acad. Phila. Proc. **1891**: 88. 1891; Syll. Fung. **10**: 650. 1892.
259. *C. kansensis* Syd. Ann. Myc. **5**: 340. 1907; Syll. Fung. **22**: 1426. 1913.
260. *C. Kellermani* Bubák, Jour. Myc. **9**: 3. 1903; Syll. Fung. **18**: 597. 1906; Jour. Myc. **9**: 24. 1903.
261. *C. Langloisii* Sacc. Syll. Fung. **10**: 647. 1892; Jour. Myc. **3**: 21. 1887, as *C. pallida* Ell. & Ev., not Berk. & Curt.
262. *C. lanuginosa* Heald & Wolf, Myc. **3**: 17. 1911; B. P. I. Bull. 226: 60. 1912.
263. *C. latens* Ell. & Ev. Jour. Myc. **4**: 3. 1888; Syll. Fung. **10**: 641. 1892.
264. *C. lateritia* Ell. & Halst. Jour. Myc. **4**: 7. 1888; Syll. Fung. **10**: 646. 1892.
265. *C. Lathyri* Dearn. & House, N. Y. Mus. Bull. 188: 30. 1916.
266. *C. Lathyrina* Ell. & Ev. Acad. Phila. Proc. **1891**: 91. 1891; Syll. Fung. **10**: 621. 1892.
267. *C. Leonotidis* Cooke, Grev. **8**: 72. 1879; Syll. Fung. **4**: 470. 1886; Syll. Fung. **10**: 631. 1892; Jour. Myc. **3**: 18. 1887.
268. *C. Lepidii* Peck, N. Y. Mus. Rept. **35**: 140. 1884; Syll. Fung. **4**: 432. 1886; Jour. Myc. **1**: 62. 1885.
269. *C. leptosperma*[1] Peck, N. Y. Mus. Rept. **30**: 55. 1878; Syll. Fung. **4**: 442. 1886; Jour. Myc. **1**: 38. 1885.

[1] Davis in Wisc. Acad. Trans. **19**: 706. 1919, says "Instead of *Cercospora leptosperma* Pk. or *Cylindrosporium leptospermum* Pk., I am now using *Cercosporella leptosperma* Pk." and in *l. c.* **20**: 401. 1922, he gives "*Septoriopsis Leptosperma* (Pk.) n. comb."

270. *C. Lespedezae* Ell. & Dearn. Can. Inst. Proc. **1**: 91. 1897; Syll. Fung. **14**: 1100. 1899.
271. *C. leucosticta* Ell. & Ev. Jour. Myc. **4**: 53. 1888; Syll. Fung. **10**: 640. 1892.
272. *C. Ligustri* Roum. Rev. Myc. **5**: 177. 1883; Syll. Fung. **4**: 471. 1886; B. P. I. Bull. 226: 77. 1912.
273. *C. lilacis* (Desm.) Sacc. Michelia **2**: 128. 1880; Ann. Sci. Nat. Bot. III, **11**: 364. 1849, as *Exosporium lilacis* Desm.; Syll. Fung. **4**: 471. 1886; U. S. D.A. Bull. 1366. 1926.
274. *C. Lini* Ell. & Ev. Jour. Myc. **3**: 16. 1887; Syll. Fung. **10**: 620. 1892.
275. *C. Lippiae* Ell. & Ev. Jour. Myc. **3**: 20. 1887; Syll. Fung. **10**: 632. 1892; Wisc. Acad. Trans. **17**: 893. 1914.
276. *C. Liriodendri* Ell. & Harkn. Torr. Bot. Club Bull. **8**: 27. 1881; Syll. Fung. **4**: 459. 1886; Jour. Myc. **1**: 37. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 67. 1892.
277. *C. Lobeliae* Kell. & Sw. Jour. Myc. **5**: 75. 1889; Syll. Fung. **10**: 631. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 47. 1892.
278. *C. longispora*[1] Peck, N. Y. Mus. Rept. **35**: 141. 1884; Syll. Fung. **4**: 436. 1886; Jour. Myc. **1**: 63. 1885; Wisc. Acad. Trans. **19**: 702. 1919.
279. *C. Ludwigiae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 58. 1892; Syll. Fung. **10**: 625. 1892.
280. *C. lumbricoides* Turconi & Maffei, Bot. Univ. Pavia Atti, II, **12**: 330. 1915; Syll. Fung. **22**: 1423. 1913.
281. *C. Lupini* Cooke, Hedw. **17**: 39. 1878; Syll. Fung. **4**: 436. 1886; Jour. Myc. **1**: 55. 1885.
282. *C. lupinicola* Lieneman, nom. nov.
(*C. texensis* Tharp, Myc. **9**: 115. 1917, not *C. texensis* Ell. & Gall. Jour. Myc. **4**: 116. 1888.)
283. *C. Lycii* Ell. & Halst. Jour. Myc. **4**: 7. 1888; Syll. Fung. **10**: 649. 1892.
284. *C. Lycopi* Ell. & Ev. Jour. Myc. **3**: 15. 1887; Syll. Fung. **10**: 630. 1892.
285. *C. Lysimachiae* Ell. & Halst. Jour. Myc. **6**: 34. 1890; Syll. Fung. **10**: 631. 1892.
286. *C. Lythracearum* Heald & Wolf, Myc. **3**: 18. 1911; B. P. I. Bull. 226: 64, 76. 1912.
287. *C. Lythri* (Westd.) Niessl. Hedw. **15**: 1. 1876; Syll. Fung. **4**: 452. 1886; Acad. Roy. Sci. Belgique Bull. **21**^{2}: 240. 1854, as *Cladosporium Lythri* Westd.; Wisc. Acad. Trans. **14**: 96. 1903; *l. c.* **17**: 893. 1914.
288. *C. MacClatchieana*[2] Sacc. & Syd. Syll. Fung. **14**: 1106. 1899; Erythea **2**: 26. 1894, as *C. fuliginosa* Ell. & Ev., not *C. fuliginosa* Ell. & Kell.; Syll. Fung. **11**: 626. 1895, as *C. fuliginosa* Ell. & Ev., not *C. fuliginosa* Ell. & Kell.

[1] Davis in Wisc. Acad. Trans. **20**: 401. 1922, has cited this fungus as "*Septoriopsis Longispora* (Pk.) n. comb."

[2] J. J. Davis, in Wisc. Acad. Trans. **18**: 86. 1915, says that *C. Ceanothi* Kell. & Sw. is present earlier in life and *C. fuliginosa* Ell. & Ev. later in life of plant. "It is probable . . . that the description of *C. Ceanothi* Kell. & Swingle and *C. fuliginosa* Ell. & Evht. were drawn from different states of the same fungus. The former is the prior name and the latter is antedated by *C. fuliginosa* Ell. & Kell. on *Diospyros* (1887) for which reason *C. MacClatchieana* Sacc. & Syd. was substituted."

289. *C. Maclurae* Ell. & Ev. Jour. Myc. **8**: 72. 1902; Syll. Fung. **18**: 610. 1906.
290. *C. macrochaeta* Ell. & Ev. Torr. Bot. Club Bull. **24**: 473. 1897; Syll. Fung. **14**: 1105. 1899.
291. *C. macroguttata* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 64. 1892; Syll. Fung. **10**: 628. 1892.
292. *C. macromaculans* Heald & Wolf, Myc. **3**: 18. 1911; B. P. I. Bull. 226: 70. 1912.
293. *C. Magnoliae* Ell. & Harkn. Torr. Bot. Club Bull. **8**: 27. 1881; Syll. Fung. **4**: 459. 1886; Jour. Myc. **1**: 35. 1885; N. J. Agr. Sta. Bull. 313: 136. 1917.
294. *C. Majanthemi* Fckl. Symb. Myc. 353. 1869–70; Syll. Fung. **4**: 476. 1886; *l. c.* **10**: 654. 1892; Jour. Myc. **9**: 111. 1903; Myc. **18**: 179. 1926.
295. *C. Malachrae*[1] Heald & Wolf, Myc. **3**: 19. 1911; B. P. I. Bull. 226: 97. 1912.
296. *C. Mali* Ell. & Ev. Jour. Myc. **4**: 116. 1888; Syll. Fung. **10**: 643. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 55. 1892; B. P. I. Bull. 226: 24. 1912.
297. *C. Malloti* Ell. & Ev. Jour. Myc. **4**: 114. 1888; Syll. Fung. **10**: 650. 1892.
298. *C. maritima* Tracy & Earle, Torr. Bot. Club Bull. **22**: 179. 1895; Syll. Fung. **14**: 1104. 1899.
299. *C. Marrubii* Tharp, Myc. **9**: 111. 1917.
300. *C. Medicaginis* Ell. & Ev. Acad. Phila. Proc. **1891**: 91. 1891; Syll. Fung. **10**: 622. 1892; B. P. I. Bull. 226: 48. 1912; Phytopath. **6**: 301. 1916; N. J. Agr. Sta. Bull. 313: 138. 1917; Wisc. Acad. Trans. **20**: 429. 1922.
301. *C. megalopotamica* Speg. Anal. Soc. Sci. Argent. **13**: 29. 1882; Syll. Fung. **4**: 443. 1886; Wisc. Acad. Trans. **16**: 758. 1909; *l. c.* **17**: 895. 1914; *l. c.* **18**: 256. 1915.
302. *C. melaleuca* Ell. & Ev. Torr. Bot. Club Bull. **27**: 56. 1900; Syll. Fung. **16**: 1068. 1902.
303. *C. melanochaeta* Ell. & Ev. Acad. Phila. Proc. **1894**: 380. 1894; Syll. Fung. **11**: 627. 1895.
304. *C. Meliae* Ell. & Ev. Jour. Myc. **3**: 16. 1887; Syll. Fung. **10**: 639. 1892.
305. *C. Menispermi* Ell. & Holw. Jour. Myc. **4**: 6. 1888; Syll. Fung. **10**: 618. 1892; B. P. I. Bull. 226: 92. 1912; Myc. **16**: 138. 1924.
306. *C. menthicola* Tehon & Daniels, Myc. **17**: 247. 1925.
307. *C. Merrowii* Ell. & Ev. Acad. Phila. Proc. **1894**: 380. 1894; Syll. Fung. **11**: 625. 1895.
308. *C. microsora* Sacc. Michelia **2**: 128. 1880; Bot. Gaz. **6**: 277. 1881, as *C. Tiliae* Peck; Jour. Myc. **1**: 35. 1885, as *C. Tiliae* Peck; Syll. Fung. **4**: 459. 1886; N. J. Agr. Sta. Bull. 313: 138. 1917.
309. *C. microstigma* Sacc. Ann. Myc. **10**: 315. 1912; Syll. Fung. **22**: 1431. 1913.
310. *C. Mikaniae* Ell. & Ev. Acad. Phila. Proc. **1891**: 90. 1891; Syll. Fung. **10**: 629. 1892.
311. *C. Mimuli* Ell. & Ev. Jour. Myc. **3**: 18. 1887; Syll. Fung. **10**: 631. 1892.

[1] Seaver & Chardon (Sci. Surv. Porto Rico 8^1: 95. 1926) refer *C. Malachrae* Young (Myc. **8**: 45. 1916) as a synonym of the species. The descriptions are very much alike, but Chardon does not state that he studied authentic material of Young's species. In case they are different, the latter must be renamed.

312. *C. minima* Tracy & Earle, Torr. Bot. Club Bull. **23**: 206. 1896; Syll. Fung. **14**: 1100. 1899; B. P. I. Bull. 226: 30. 1912.
313. *C. Mirabilis* Tharp, Myc. **9**: 111. 1917.
314. *C. Modiolae* Tharp, Myc. **9**: 111. 1917.
315. *C. Molluginis* Halst. Torr. Bot. Club Bull. **20**: 251. 1893.
316. *C. molluginicola* Lieneman, nom. nov.
(*C. Molluginis* Davis, Wisc. Acad. Trans. **21**: 285. 1924, not *C. Molluginis* Halst. Torr. Bot. Club Bull. **20**: 251. 1893.)
317. *C. monoica* Ell. & Holw. Jour. Myc. **1**: 6, 49. 1885; Syll. Fung. **4**: 438. 1886.
318. *C. montana* (Speg.) Sacc. Dec. Myc. 104. 1879, as *Ramularia montana* Speg.; Syll. Fung. **4**: 453. 1886; Nuovo Giorn. Bot. Ital. **23**: 220. 1916; Myc. **10**: 263. 1918; Wisc. Acad. Trans. **9**: 167. 1892; *l. c.* **15**: 780. 1907; *l. c.* **16**: 746. 1909.
319. *C. moricola* Cooke, Grev. **12**: 30. 1883; Syll. Fung. **4**: 475. 1886; Jour. Myc. **1**: 34. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 43. 1892; Cornell Univ. Bull. 3^1: 41. 1897; B. P. I. Bull. 226: 74. 1912; Wisc. Acad. Trans. **21**: 261. 1924.
320. *C. Morongiae* Tracy & Earle, Torr. Bot. Club Bull. **26**: 495. 1899; Syll. Fung. **16**: 1074. 1902.
321. *C. Muhlenbergiae* Atk. Cornell Univ. Bull. 3^1: 46. 1897; Syll. Fung. **14**: 1106. 1899; Wisc. Acad. Trans. **20**: 421. 1922.
322. *C. murina* Ell. & Kell. Torr. Bot. Club Bull. **11**: 122. 1884; Syll. Fung. **4**: 434. 1886; Jour. Myc. **1**: 53. 1885; Ind. Acad. Proc. **1921**: 147. 1921.
323. *C. Myricae* Tracy & Earle, Torr. Bot. Club Bull. **23**: 206. 1896; Syll. Fung. **14**: 1105. 1899.
324. *C. Namae* Dearn. & House, N. Y. Mus. Bull. 179: 34. 1915.
325. *C. Nasturtii* Pass. Hedw. **16**: 124. 1877; Syll. Fung. **4**: 433. 1886; Jour. Myc. **3**: 16. 1887; Wisc. Acad. Trans. **11**: 171. 1897; *l. c.* **19**: 687. 1919; *l. c.* **21**: 294. 1924; B. P. I. Bull. 226: 104. 1912; Ind. Acad. Proc. **1921**: 147. 1922.
326. *C. Negundinis* Ell. & Ev. Acad. Phila. Proc. **1891**: 89. 1891; Syll. Fung. **10**: 638. 1892.
327. *C. Nelumbonis* Tharp, Myc. **9**: 111. 1917.
328. *C. Nepetae* Tehon, Myc. **16**: 140. 1924.
329. *C. Nepheloides* Ell. & Holw. B. P. I. Bull. 226: 87. 1912.
330. *C. neriella* Sacc. Michelia **2**: 294. 1881; Syll. Fung. **4**: 473. 1886; U. S. D. A. Bull. 1366. 1926.
331. *C. Nesaeae* Ell. & Ev. Acad. Phila. Proc. **1893**: 170. 1893; Syll. Fung. **11**: 625. 1895.
332. *C. Nicotianae* Ell. & Ev. Acad. Phila. Proc. **1893**: 170. 1893; Syll. Fung. **11**: 628. 1895; B. P. I. Bull. 226: 105. 1912.
333. *C. nigri* Tharp, Myc. **9**: 112. 1917.
334. *C. nigricans* Cooke, Grev. **12**: 30. 1883; Syll. Fung. **4**: 462. 1886; Jour. Myc. **1**: 52. 1885.
335. *C. noveboracensis* Ell. & Ev. Jour. Myc. **3**: 14. 1887; Syll. Fung. **10**: 628. 1892.

336. *C. nubilosa*[1] Ell. & Ev. Jour. Myc. **4**: 115. 1888; Syll. Fung. **10**: 654. 1892; Mo. Bot. Gard. Ann. **14**: 425. 1927.
337. *C. Nymphaeacea* Cooke & Ell. Grev. **6**: 89. 1878; Syll. Fung. **4**: 432. 1886; Jour. Myc. **1**: 22. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 54. 1892; Wisc. Acad. Trans. **14**: 97. 1903; *l. c.* **17**: 891. 1914.
338. *C. Nyssae* Tharp, Myc. **9**: 112. 1917.
339. *C. obesa* Ell. & Ev. Jour. Myc. **4**: 5. 1888; Syll. Fung. **10**: 626. 1892; N. J. Agr. Sta. Bull. 313: 140. 1917.
340. *C. obscura* Heald & Wolf, Myc. **3**: 19. 1911; B. P. I. Bull. 226: 40. 1912.
341. *C. occidentalis* Cooke, Hedw. **17**: 39. 1878; Syll. Fung. **4**: 463. 1886; Jour. Myc. **1**: 50. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 43. 1892; B. P. I. Bull. 226: 101. 1912.
342. *C. oculata* Ell. & Kell. Torr. Bot. Club Bull. **11**: 116. 1884; Syll. Fung. **4**: 443. 1886; Jour. Myc. **1**: 22. 1885.
343. *C. Oenotherae* Ell. & Ev. Acad. Phila. Proc. **1894**: 380. 1894; Syll. Fung. **11**: 625. 1895.
344. *C. Oenotherae-sinuatae* Atk. Cornell Univ. Bull. **3**[1]: 46. 1897; Syll. Fung. **14**: 1099. 1899.
345. *C. olivacea*[2] (Berk. & Rav.) Ell. Jour. Myc. **1**: 52. 1885; Grev. **3**: 102. 1875, as *Helminthosporium olivaceum* Berk. & Rav.; Syll. Fung. **4**: 462. 1886.
346. *C. omphakodes* Ell. & Holw. Jour. Myc. **1**: 5, 23. 1885; Syll. Fung. **4**: 447. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 42. 1892; Torr. Bot. Club Bull. **25**: 366. 1898.
347. *C. Oryzae* Miyake, Tokyo Coll. Agr. Jour. **2**: 263. 1910; Syll. Fung. **22**: 1431. 1913; U. S. D. A. Bull. 1366. 1926.
348. *C. Osmorhizae* Ell. & Ev. Acad. Phila. Proc. **1891**: 89. 1891; Syll. Fung. **10**: 624. 1892; Wisc. Acad. Trans. **20**: 421. 1922.
349. *C. Oxybaphi* Ell. & Halst. Jour. Myc. **4**: 8. 1888; Syll. Fung. **10**: 636. 1892; Wisc. Acad. Trans. **21**: 258. 1924.
350. *C. Oxydendri*[3] Tracy & Earle, Torr. Bot. Club Bull. **26**: 495. 1899; Syll. Fung. **16**: 1067. 1902.
351. *C. pachypus* Ell. & Kell. Jour. Myc. **3**: 104. 1887; Syll. Fung. **10**: 628. 1892; Jour. Myc. **4**: 7, 29. 1888; B. P. I. Bull. 226: 103. 1912.
352. *C. pachyspora* Ell. & Ev. Acad. Phila. Proc. **1891**: 88. 1891; Syll. Fung. **10**: 654. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 45. 1892.
353. *C. Paeoniae* Tehon & Daniels, Myc. **17**: 247. 1925.
354. *C. Pancratii* Ell. & Ev. Jour. Myc. **3**: 15. 1887; Syll. Fung. **10**: 654. 1892.

[1] The original citation gives *Smilax* as host, but from type material in the herbarium of the Missouri Botanical Garden, the host has been determined as *Dioscorea villosa*.—*Cf.* Mo. Bot. Gard. Ann. **14**: 425. 1927.

[2] In Grev. **12**: 30. 1883, Cooke uses the name *C. Berkeleyi* Cooke (*l. c.* and Fungi Am. 777, nomen nudum) to replace *C. olivacea* as above and *Helminthosporium pistillare* Cooke, Fungi Am. 777, nomen nudum. *C. Seymouriana* Wint. Hedw. **22**: 70. 1883, is added by Saccardo (*l. c.*). *C. olivacea* is here treated in this composite sense.

[3] An examination of type material in the herbarium of the Missouri Botanical Garden seems to confirm the similarity between *C. Oxydendri* Tracy & Earle and *C. Oxydendri* Ell. & Ev. Jour. Myc. **8**: 71. 1902; Syll. Fung. **18**: 606. 1906. In this event, the latter should be regarded as a synonym of the former.

355. *C. Panici* Davis, Wisc. Acad. Trans. **19**: 714. 1919.
356. *C. papillosa*[1] Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 52. 1892; Syll. Fung. **10**: 632. 1892.
357. *C. Passaloroides* Wint. Hedw. **22**: 71. 1883; Syll. Fung. **4**: 463. 1886; Jour. Myc. **1**: 50. 1885; Wisc. Acad. Trans. **18**: 106. 1915.
358. *C. Pastinacae* (Sacc.) Peck, N. Y. Mus. Bull. 157: 45, 107. 1912.[2]
359. *C. penicillus* Ell. & Ev. Jour. Myc. **4**: 115. 1888; Syll. Fung. **10**: 652. 1892.
360. *C. Pentstemonis* Ell. & Kell. Torr. Bot. Club Bull. **11**: 121. 1884; Syll. Fung. **4**: 447. 1886; Jour. Myc. **1**: 24. 1885; Ala. Agr. Sta. Bull. 80: 148. 1897; Wisc. Acad. Trans. **9**: 167. 1892; *l. c.* **17**: 894. 1914; *l. c.* **18**: 260. 1915.
361. *C. perfoliata* Ell. & Ev. Jour. Myc. **5**: 71. 1889; Syll. Fung. **10**: 627. 1892; Wisc. Acad. Trans. **9**: 167. 1893; *l. c.* **17**: 894. 1914.
362. *C. perniciosa* Heald & Wolf, Myc. **3**: 19. 1911; B. P. I. Bull. 226: 61. 1912.
363. *C. personata* (Berk. & Curt.) Ell. & Ev. Jour. Myc. **1**: 63. 1885; Grev. **3**: 106. 1875, as *Cladosporium personatum* Berk. & Curt.; Syll. Fung. **4**: 439. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 43. 1892; B. P. I. Bull. 226: 49. 1912; Myc. **9**: 112. 1917; *l. c.* **16**: 138. 1924.
364. *C. personata* (Berk. & Curt.) Ell. & Ev. var. *Cassiae-occidentalis* Sacc. Syll. Fung. **4**: 439. 1886.
365. *C. Phaseolorum* Cooke, Grev. **12**: 30. 1883; Syll. Fung. **4**: 436. 1886; Jour. Myc. **1**: 55. 1885.
366. *C. Phlogina* Peck, N. Y. Mus. Bull. 150: 24. 1911.
367. *C. Phyllitidis* Hume, Torr. Bot. Club Bull. **27**: 577. 1900; Syll. Fung. **16**: 1074. 1902.
368. *C. physalicola* Ell. & Barth. Erythea **4**: 28. 1896; Syll. Fung. **14**: 1102. 1899; B. P. I. Bull. 226: 96. 1912.
369. *C. Physalidis* Ell. Am. Nat. **16**: 810. 1882; Syll. Fung. **4**: 450. 1886; Jour. Myc. **1**: 19. 1885; Wisc. Acad. Trans. **17**: 894. 1914.
370. *C. Piaropi* Tharp, Myc. **9**: 113. 1917.
371. *C. pinnulaecola* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 64. 1892; Syll. Fung. **10**: 640. 1892.
372. *C. Plantaginella* Tehon, Myc. **16**: 139. 1924.
373. *C. Plantaginis* Sacc. Michelia **1**: 267. 1878; Syll. Fung. **4**: 454. 1886; Jour. Myc. **1**: 19. 1885.
374. *C. platanicola* Ell. & Ev. Jour. Myc. **3**: 17. 1887; Syll. Fung. **10**: 652. 1892; Jour. Myc. **9**: 168. 1903.

[1] In Cornell Univ. Bull. **3**[1]: 44. 1897, Atkinson says, "**C. verbenaecola** E. & E. This was described p. 20 Jour. Elisha Mitchell Sci. Soc. VIII, 1892, as a new species, C. papillosa. A later examination of fresh specimens does not seem to show any persistent character which will distinguish it from E. & E's. species."

[2] "*C. Pastinacae* (Sacc.) comb. nov.

"This fungus was originally referred by Mr. Ellis to Cercospora Apii Fres. [Jour. Myc. **1**: 36. 1885], though with some hesitation, as he says he is strongly of the opinion that it will yet prove to be distinct. Prof. Saccardo [Syll. Fung. **4**: 442. 1886] later gave it the name C. Apii Pastinacae Sacc. It appears to us to be a distinct species in its numerous small spots limited by the veinlets of the leaf; in its broader aseptate hyphae and specially in its broader, subcylindric conidia with only 1–3 septa."

375. *C. platyspora*[1] Ell. & Holw. Jour. Myc. **3**: 16. 1887; Syll. Fung. **10**: 625. 1892.
376. *C. Podophylli* Tehon & Daniels, Myc. **19**: 128. 1927.
377. *C. Polygonacea* Ell. & Ev. Jour. Myc. **1**: 24. 1885; Syll. Fung. **4**: 455. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 47. 1892; B. P. I. Bull. 226: 97. 1912.
378. *C. Polytaeniae* Ell. & Kell. Jour. Myc. **3**: 104. 1887; Syll. Fung. **10**: 624. 1892; Wisc. Acad. Trans. **19**: 702. 1919.
379. *C. polytricha* Cooke, Grev. **7**: 35. 1878; Syll. Fung. **4**: 475. 1886; Jour. Myc. **1**: 56. 1885.
380. *C. Pontederiae* Ell. & Dearn. Can. Rec. Sci. **5**: 270. 1893; Syll. Fung. **11**: 629. 1895.
381. *C. populicola* Tharp, Myc. **9**: 113. 1917.
382. *C. Populina* Ell. & Ev. Jour. Myc. **3**: 20. 1887; Syll. Fung. **10**: 651. 1892; Iowa Acad. Proc. **7**: 164. 1899.
383. *C. Prenanthis* Ell. & Kell. Jour. Myc. **3**: 104. 1887; Syll. Fung. **10**: 626. 1892; Tuskegee Exp. Sta. Bull. **4**: 7. 1904.
384. *C. Prosopidis* Heald & Wolf, Myc. **3**: 20. 1911; B. P. I. Bull. 226: 73. 1912.
385. *C. prunicola* Ell. & Ev. Jour. Myc. **3**: 17. 1887; Syll. Fung. **10**: 643. 1892.
386. *C. psedericola* Tehon, Myc. **16**: 139. 1924.
387. *C. Pteleae* Wint. Hedw. **24**: 205. 1885; Syll. Fung. **4**: 465. 1886; Jour. Myc. **1**: 125. 1885.
388. *C. pulcherrimae* Tharp, Myc. **9**: 114. 1917.
389. *C. pulcherrimae minima* Tharp, Myc. **9**: 114. 1917.
390. *C. pulvinula* Cooke & Ell. Grev. **7**: 40. 1878; Syll. Fung. **4**: 467. 1886; Jour. Myc. **1**: 51. 1885.
391. *C. pulvinulata*[2] Sacc. & Wint. Ist. Veneto Atti. **6**[3]: 728. 1885; Hedw. **24**: 258. 1885, as *C. missouriensis* Wint.; Syll. Fung. **4**: 474. 1886; Jour. Myc. **1**: 106. 1885; B. P. I. Bull. 226: 74. 1912.
392. *C. punctoidea*[3] Ell. & Holw. Wisc. Acad. Trans. **9**: 167. 1893.
393. *C. purpurea* Cooke, Grev. **7**: 34. 1878; Am. Nat. **18**: 189. 1884, as *C. Perseae* Ell. & Mart.; Syll. Fung. **4**: 464. 1886; Jour. Myc. **1**: 34. 1885.
394. *C. Pyri* Farlow, Appalachia 3: 250. 1884; Syll. Fung. **4**: 461. 1886; Jour. Myc. **1**: 54. 1885; Wisc. Acad. Trans. **17**: 892. 1914.
395. *C. racemosa* Ell. & Mart. Am. Nat. **19**: 76. 1885; Syll. Fung. **4**: 446. 1886; Jour. Myc. **1**: 55. 1885; *l. c.* **3**: 21. 1887.
396. *C. Rafinesquiae* Harkn. Calif. Acad. Bull. **1**: 39. 1884; Syll. Fung. **4**: 445. 1886; Jour. Myc. **1**: 51. 1885.

[1] J. J. Davis in Wisc. Acad. Trans. **21**: 275. 1924 says: "*Cercospora platyspora* Ell. & Holw. is doubtfully distinct from *Cercospora sii* E. & E. and from *Fusicladium depressum* (B. & Br.) Sacc."

[2] As pointed out by Sacc. Syll. Fung. **4**: 474. 1886, *C. pulvinulata* need not be regarded as a homonym because of the existence of *C. pulvinula* Cooke & Ell. Grev. **7**: 40. 1878. *C. missouriensis*, then, becomes a synonym of *C. pulvinulata*.

[3] This is cited as occurring on *Galium trifidum* Ait., but in Wisc. Acad. Trans. **20**: 405. 1922, Davis says: "*Cercospora punctoidea* Ell. & Hol. (in lit.) was recorded in 'A Supplementary List of Parasitic Fungi of Wisconsin,' No. 312 (Trans. Wis. Acad. **9**: 167), but a description was never published presumably because Mr. Ellis concluded it was not distinct."

397. *C. Ranunculi* Ell. & Holw. Jour. Myc. **1**: 5, 50. 1885; Syll. Fung. **4**: 431. 1886; Wisc. Acad. Trans. **20**: 428. 1922.
398. *C. Ratibidae* Ell. & Barth. Jour. Myc. **8**: 177. 1902; Syll. Fung. **18**: 608. 1906; Wisc. Acad. Trans. **21**: 286. 1924.
399. *C. reducta* Syd. Ann. Myc. **1**: 178. 1903; Jour. Myc. **8**: 71. 1902, as *C. sessilis* Ell. & Ev., not Sorok; Syll. Fung. **18**: 610. 1906.
400. *C. regalis* Tharp, Myc. **9**: 114. 1917.
401. *C. repens* Ell. & Ev. Jour. Myc. **3**: 14. 1887; Syll. Fung. **10**: 638. 1892.
402. *C. Resedae* Fckl. Symb. Myc. 353. 1869–70; Syll. Fung. **4**: 435. 1886; Jour. Myc. **1**: 21. 1885; N. J. Agr. Sta. Bull. 313: 140. 1917.
403. *C. Rhamni* Fckl. Symb. Myc. 354. 1869–70; Syll. Fung. **4**: 466. 1886; Jour. Myc. **3**: 16. 1887; Wisc. Acad. Trans. **20**: 416. 1922.
404. *C. Rhapontici* Tehon & Daniels, Myc. **17**: 248. 1925.
405. *C. Rhuina*[1] Cooke & Ell. Grev. **6**: 89. 1878; Syll. Fung. **4**: 467. 1886; Jour. Myc. **1**: 33. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 47. 1892; Iowa Acad. Proc. **7**: 165. 1899; B. P. I. Bull. 226: 78. 1912; N. J. Agr. Sta. Bull. 313: 140. 1917.
406. *C. Rhuina* Cooke & Ell. var. *nigromaculans* Peck, N. Y. Mus. Rept. **42**: 33. 1889.
407. *C. ribicola* Ell. & Ev. Acad. Phila. Proc. **1894**: 379. 1894; Syll. Fung. **11**: 626. 1895; Wisc. Acad. Trans. **15**: 778. 1907.
408. *C. Ribis* Earle, Torr. Bot. Club Bull. **25**: 366. 1898; Syll. Fung. **16**: 1066. 1902.
409. *C. richardiaecola* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 51. 1892; Syll. Fung. **10**: 653. 1892.
410. *C. Ricinella* Sacc. & Berl. Misc. Myc. **2**: 11. 1885; Hedw. **24**: 202. 1885, as *C. albidomaculans* Wint.; Syll. Fung. **4**: 456. 1886; Jour. Myc. **1**: 124. 1885; B. P. I. Bull. 226: 84. 1912.
411. *C. rigospora* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 65. 1892; Syll. Fung. **10**: 635. 1892; Ala. Agr. Sta. Bull. 80: 150. 1897.
412. *C. rosicola* Pass. Myc. Univ. 1086. 1878; Syll. Fung. **4**: 460. 1886; Hedw. **24**: 205. 1885; Jour. Myc. **1**: 35. 1885; *l. c.* **4**: 29. 1888; B. P. I. Bull. 226: 88. 1912; N. J. Agr. Sta. Bull. 313: 140. 1917.
413. *C. rosicola* Pass. var. *undosa* Davis, Wisc. Acad. Trans. **20**: 405. 1922.
414. *C. Rosigena* Tharp, Myc. **9**: 114. 1917.
415. *C. rubella* Cooke, Grev. **7**: 34. 1878; Syll. Fung. **4**: 454. 1886; Jour. Myc. **1**: 22. 1885.
416. *C. Rubi* Sacc. Nuovo Giorn. Bot. Ital. **8**: 188. 1876; Syll. Fung. **4**: 461. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 54. 1892; Cornell Univ. Bull. **3**^{1}: 44. 1897; N. J. Agr. Sta. Bull. 313: 142. 1917; Ind. Acad. Proc. **1921**: 147. 1922.
417. *C. Rubigo* Cooke & Harkn. Grev. **13**: 17. 1884; Syll. Fung. **4**: 461. 1886; Jour. Myc. **1**: 40. 1885; Wisc. Acad. Trans. **17**: 892. 1914; *l. c.* **20**: 429. 1922.
418. *C. rubrotincta* Ell. & Ev. Jour. Myc. **3**: 20. 1887; Syll. Fung. **10**: 643. 1892.
419. *C. Rudbeckiae* Peck, N. Y. Mus. Bull. 131: 19. 1909; Syll. Fung. **22**: 1427. 1918; Wisc. Acad. Trans. **21**: 289. 1924.

[1] According to Jour. Myc. **1**: 33. 1885, *C. copallina* Cooke, Grev. **12**: 31. 1883, and Syll. Fung. **4**: 468. 1886, is a synonym of *C. Rhuina* Cooke & Ell.

420. *C. Sabbatiae* Ell. & Ev. Jour. Myc. **4**: 3. 1888; Syll. Fung. **10**: 634. 1892.
421. *C. Sagittariae* Ell. & Kell. Jour. Myc. **2**: 1. 1886; Syll. Fung. **4**: 479. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 61. 1892; Wisc. Acad. Trans. **14**: 89. 1903; B. P. I. Bull. 226: 90. 1912; Wisc. Acad. Trans. 17: 890. 1914.
422. *C. Salicina* Ell. & Ev. Jour. Myc. **3**: 19. 1887; Syll. Fung. **10**: 651. 1892; B. P. I. Bull. 226: 82. 1912.
423. *C. salviicola* Tharp, Myc. **9**: 115. 1917.
424. *C. Sanguinariae* Peck, N. Y. Mus. Rept. **33**: 29. 1880; Syll. Fung. **4**: 433. 1886; Jour. Myc. **1**: 50. 1885; Wisc. Acad. Trans. **15**: 267. 1915.
425. *C. Saniculae* Davis, Wisc. Acad. Trans. **19**: 687. 1919; *l. c.* **21**: 275. 1924.
426. *C. Saururi* Ell. & Ev. Jour. Myc. **3**: 14. 1887; Syll. Fung. **10**: 652. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 54. 1892.
427. *C. Scolecotrichoides* Atk. Cornell Univ. Bull. 3^1: 46. 1897; Syll. Fung. **14**: 1106. 1899.
428. *C. Scutellariae* Ell. & Ev. Jour. Myc. **4**: 54. 1888; Syll. Fung. **10**: 630. 1892.
429. *C. Sedi* Ell. & Ev. Jour. Myc. **8**: 72. 1902; Syll. Fung. **18**: 596. 1906.
430. *C. Sedoidis* Ell. & Ev. Jour. Myc. **4**: 4. 1888; Syll. Fung. **10**: 623. 1892.
431. *C. seminalis* Ell. & Ev. Jour. Myc. **4**: 4. 1888; Syll. Fung. **10**: 656. 1892.
432. *C. Senecionis* Ell. & Ev. Acad. Phila. Proc. **1891**: 90. 1891; Syll. Fung. **10**: 629. 1892.
433. *C. septatissima* Tracy & Earle, Torr. Bot. Club Bull. **23**: 206. 1896; Syll. Fung. **14**: 1103. 1899.
434. *C. septorioides* Ell. & Ev. Field Mus. Bot. Ser. Rept. **1**: 94. 1896; Syll. Fung. **14**: 1101. 1899.
435. *C. Sequoiae* Ell. & Ev. Jour. Myc. **3**: 13. 1887; Syll. Fung. **10**: 653. 1892; Wisc. Acad. Trans. **16**: 746. 1909.
436. *C. Sequoiae Juniperi* Ell. & Ev. Jour. Myc. **3**: 14. 1887; Syll. Fung. **10**: 653. 1892.
437. *C. seriata* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 59. 1892; Syll. Fung. **10**: 657. 1892.
438. *C. Serpentariae* Ell. & Ev. Jour. Myc. **3**: 13. 1887; Syll. Fung. **10**: 636. 1892.
439. *C. Setariae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 50. 1892; Syll. Fung. **10**: 655. 1892; Ala. Agr. Sta. Bull. 80: 151. 1897.
440. *C. setariicola* Tehon & Daniels, Myc. **19**: 128. 1927.
441. *C. sidaecola* Ell. & Ev. Jour. Myc. **5**: 72. 1889.
442. *C. Sii* Ell. & Ev. Jour. Myc. **5**: 71. 1889; Syll. Fung. **10**: 624. 1892.
443. *C. Silphii* Ell. & Ev. Jour. Myc. **4**: 3, 29. 1888; Syll. Fung. **10**: 628. 1892; Elisha Mitchell Sci. Soc. Jour. **8**: 60. 1892.
444. *C. Silphii* Ell. & Ev. var. *laciniati* Tehon & Daniels, Myc. **19**: 128. 1927.
445. *C. simulans* Ell. & Kell. Jour. Myc. **8**: 14. 1902; Syll. Fung. **18**: 599. 1906.
446. *C. simulata* Ell. & Ev. Jour. Myc. **1**: 64. 1885; Syll. Fung. **4**: 463. 1886.
447. *C. Smilacina*[1] Sacc. Michelia **2**: 364. 1881; N. Y. Mus. Rept. **33**: 29. 1880, as *C. Smilacis* Peck; Syll. Fung. **4**: 476. 1886; B. P. I. Bull. 226: 102. 1912.

[1] *C. Petersii* (Berk. & Curt.) Atk. is made a synonym in Mo. Bot. Gard. Ann. **14**: 429. 1927. It was described in Elisha Mitchell Sci. Soc. Jour. **8**: 57. 1892, Grev. **3**: 102. 1875, and Syll. Fung. **4**: 421. 1886, as *Helminthosporium Petersii* Berk. & Curt.

448. *C. Smilacinae* Ell. & Ev. Torr. Bot. Club Bull. **27**: 577. 1900; Syll. Fung. **16**: 1073. 1902.
449. *C. Smilacis* Thuem. Hedw. **19**: 35. 1880; Syll. Fung. **4**: 476. 1886; Torr. Bot. Club Bull. **22**: 179. 1895, as *C. mississippiensis* Tracy & Earle; Syll. Fung. **14**: 1105. 1899, as *C. mississippiensis* Tracy & Earle; Jour. Myc. **1**: 33. 1885; Mo. Bot. Gard. Ann. **14**: 428. 1917.
450. *C. solanicola* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 53. 1892; Syll. Fung. **10**: 635. 1892.
451. *C. sordida* Sacc. Michelia **2**: 149. 1880; Syll. Fung. **4**: 470. 1886; Jour. Myc. **1**: 53. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 63. 1892; B. P. I. Bull. 226: 79. 1912.
452. *C. Sorghi* Ell. & Ev. Jour. Myc. **3**: 15. 1887; Syll. Fung. **10**: 656. 1892; B. P. I. Bull. 226: 51. 1912.
453. *C. sparsa* Cooke, Grev. **12**: 31. 1883; Syll. Fung. **4**: 472. 1886; Jour. Myc. **1**: 51. 1885.
454. *C. sphaeriaeformis* Cooke, Grev. **6**: 140. 1878; Syll. Fung. **4**: 474. 1886; Jour. Myc. **1**: 51. 1885.
455. *C. squalidula* Peck, N. Y. Mus. Rept. **33**: 29. 1880; Syll. Fung. **4**: 431. 1886; Jour. Myc. **1**: 40. 1885; Tuskegee Sta. Bull. **4**: 8. 1904.
456. *C. Stachydis* Ell. & Ev. Torr. Bot. Club Bull. **24**: 474. 1897; Syll. Fung. **14**: 1103. 1899.
457. *C. Stillingiae* Ell. & Ev. Jour. Myc. **3**: 20. 1887; Syll. Fung. **10**: 650. 1892.
458. *C. stomatica* Ell. & Davis, Acad. Phila. Proc. **1895**: 438. 1896; Syll. Fung. **14**: 1102. 1899; Wisc. Acad. Trans. **21**: 275. 1924.
459. *C. Streptopi* Dearn. & Barth. Myc. **9**: 363. 1917.
460. *C. striaeformis* Wint. Hedw. **25**: 103. 1886; Syll. Fung. **10**: 655. 1892.
461. *C. Stylismae* Tracy & Earle, Torr. Bot. Club Bull. **23**: 206. 1896; Syll. Fung. **14**: 1103. 1899.
462. *C. subsanguinea* Ell. & Ev. Jour. Myc. **4**: 4. 1888; Syll. Fung. **10**: 655. 1892; Mo. Bot. Gard. Ann. **14**: 425. 1927.
463. *C. superflua* Ell. & Holw. Jour. Myc. **2**: 2. 1886; Syll. Fung. **4**: 471. 1886.
464. *C. Symphoricarpi* Ell. & Ev. Jour. Myc. **5**: 70. 1889; Syll. Fung. **10**: 645. 1892.
465. *C. Symplocarpi* Peck in Thuem. Myc. Univ. 669. 1877; Syll. Fung. **4**: 477. 1886; Jour. Myc. **1**: 36. 1885; N. J. Agr. Sta. Bull. 313: 142. 1917.
466. *C. tabacina* Ell. & Ev. Jour. Myc. **4**: 6. 1888; Syll. Fung. **10**: 627. 1892; Wisc. Acad. Trans. **20**: 430. 1922.
467. *C. tageticola* Ell. & Ev. Jour. Myc. **8**: 72. 1902; Syll. Fung. **18**: 608. 1906.
468. *C. tenuis* Peck, N. Y. Mus. Rept. **47**: 23. 1894; Syll. Fung. **11**: 627. 1895.
469. *C. Tephrosiae* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 44. 1892; Syll. Fung. **10**: 641. 1892.
470. *C. tessellata* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 59. 1892; Syll. Fung. **10**: 656. 1892.
471. *C. Teucrii* Ell. & Kell. Torr. Bot. Club Bull. **11**: 116. 1884; Syll. Fung. **4**: 446. 1886; Jour. Myc. **1**: 20. 1885; Wisc. Acad. Trans. **21**: 262. 1924.
472. *C. texensis* Ell. & Gall. Jour. Myc. **4**: 116. 1888; Syll. Fung. **10**: 646. 1892.
473. *C. Thaliae* Ell. & Langl. Jour. Myc. **6**: 36. 1890; Syll. Fung. **10**: 654. 1892.
474. *C. Thaspii* Ell. & Ev. in Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 61. 1892.

475. *C. Thermopsidis* Earle, N. Y. Bot. Gard. Bull. **2**: 348. 1902; Syll. Fung. **18**: 600. 1906.
476. *C. tinea* Sacc. Michelia **1**: 268. 1878; Syll. Fung. **4**: 468. 1886; Jour. Myc. **3**: 18. 1887.
477. *C. Torae* Tharp, Myc. **9**: 115. 1917.
478. *C. torta* Tracy & Earle, Torr. Bot. Club Bull. **28**: 187. 1901; Syll. Fung. **18**: 605. 1906.
479. *C. tortipes* Davis, Wisc. Acad. Trans. **20**: 430. 1922.
480. *C. Toxicodendri* Ell. Am. Nat. **16**: 811. 1882; Syll. Fung. **4**: 467. 1886; Jour. Myc. **1**: 62. 1885.
481. *C. Tragopogonis* Ell. & Ev. Torr. Bot. Club Bull. **24**: 474. 1897; Syll. Fung. **14**: 1102. 1899.
482. *C. Tropaeoli* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 59. 1892; Syll. Fung. **10**: 619. 1892.
483. *C. truncata* Ell. & Ev. Jour. Myc. **3**: 19. 1887; Syll. Fung. **10**: 639. 1892.
484. *C. truncatella* Atk. Elisha Mitchell Sci. Soc. Jour. **8**: 44. 1892; Syll. Fung. **10**: 644. 1892.
485. *C. tuberculans* Ell. & Ev. Jour. Myc. **4**: 115. 1888; Syll. Fung. **10**: 652. 1892.
486. *C. tuberculella* Davis, Wisc. Acad. Sci. Trans. **20**: 429. 1922.
487. *C. tuberosa* Ell. & Kell. Torr. Bot. Club Bull. **11**: 116. 1884; Hedw. **23**: 171. 1884, as *C. glaucescens* Wint.; Syll. Fung. **4**: 439. 1886; Jour. Myc. **1**: 38. 1885.
488. *C. umbrata* Ell. & Holw. Jour. Myc. **2**: 2. 1886; Syll. Fung. **4**: 444. 1886; Wisc. Acad. Trans. **14**: 97. 1903; *l. c.* **17**: 895. 1914.
489. *C. unicolor*[1] Sacc. & Penz. Michelia **2**: 642. 1882; Stevens, The Fungi which Cause Plant Disease, p. 631. 1913.
490. *C. vaginae* Kreuger in Mededeel. Proefst. Suiker. **24**: 8. 1896; Syll. Fung. **14**: 1106. 1899; U. S. D. A. Bull. 1366. 1926.
491. *C. varia* Peck, N. Y. Mus. Rept. **35**: 141. 1884; Syll. Fung. **4**: 468. 1886; Jour. Myc. **1**: 63. 1885; Univ. Maine Studies **3**[1]: 22. 1902; Wisc. Acad. Trans. **18**: 294. 1915; *l. c.* **20**: 422. 1922.
492. *C. variicolor* Wint. Hedw. **24**: 205. 1885; Syll. Fung. **4**: 431. 1886; Jour. Myc. **1**: 124. 1885.
493. *C. velutina* Ell. & Kell. Torr. Bot. Club Bull. **11**: 122. 1884; Syll. Fung. **4**: 439. 1886; Jour. Myc. **1**: 52. 1885; Wisc. Acad. Trans. **19**: 702. 1919; *l. c.* **21**: 258. 1924.
494. *C. venturioides* Peck, N. Y. Mus. Rept. **34**: 47. 1881; Am. Nat. **16**: 810. 1882, as *C. Asclepiadis* Ell.; Syll. Fung. **4**: 451. 1886; Jour. Myc. **1**: 20. 1885, as *C. Asclepiadis* Ell.
495. *C. verbascicola* Ell. & Ev. Jour. Myc. **4**: 3. 1888; Syll. Fung. **10**: 633. 1892.
496. *C. Verbenae-strictae* Peck, N. Y. Mus. Bull. 150: 51. 1911; Wisc. Acad. Trans. **21**: 286. 1924.
497. *C. verbenicola* Ell. & Ev. Jour. Myc. **3**: 19. 1887; Syll. Fung. **10**: 632. 1892; Iowa Acad. Proc. **7**: 165. 1899.
498. *C. Vernoniae* Ell. & Kell. Am. Nat. **17**: 1166. 1883; Syll. Fung. **4**: 443. 1886; Hedw. **24**: 206. 1885; Jour. Myc. **1**: 21. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 46. 1892; Wisc. Acad. Trans. **9**: 168. 1893; *l. c.* **17**: 894. 1914; Cornell Univ. Bull. **3**[1]: 41. 1897; B. P. I. Bull. 226: 94. 1912.

[1] This species was originally reported on *Laurus nobilis*. The reference to it on a species of *Lilium* might well be questioned.

499. *C. vexans* C. Massal. Ann. Myc. **4**: 494. 1906; Syll. Fung. **22**: 1417. 1913; Wisc. Acad. Trans. **20**: 421. 1922.
500. *C. Viciae* Ell. & Holw. Jour. Myc. **1**: 5, 39. 1885; Syll. Fung. **4**: 438. 1886; Wisc. Acad. Trans. **17**: 892. 1914; *l. c.* **21**: 258. 1924.
501. *C. Vignae* Ell. & Ev. Jour. Myc. **3**: 19. 1887; Syll. Fung. **10**: 621. 1892; B. P. I. Bull. 226: 48. 1912.
502. *C. viminei* Tehon, Myc. **16**: 141. 1924.
503. *C. Vincetoxici* Ell. & Ev. Jour. Myc. **8**: 73. 1902; Syll. Fung. **18**: 609. 1906.
504. *C. Violae* Sacc. Nuovo Giorn. Bot. Ital. **8**: 187. 1876; Syll. Fung. **4**: 434. 1886; Jour. Myc. **1**: 19. 1885; N. Y. Mus. Rept. **38**: 100. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 53. 1892; Field Mus. Bot. Ser. Rept. **1**: 93. 1896; B. P. I. Bull. 226: 89. 1912; N. J. Agr. Sta. Bull. 313: 142. 1917; Wisc. Acad. Trans. **20**: 421. 1922.
505. *C. viridula* Ell. & Ev. Jour. Myc. **5**: 70. 1889; Syll. Fung. **10**: 632. 1892.
506. *C. Viticis* Ell. & Ev. Jour. Myc. **3**: 18. 1887; Syll. Fung. **10**: 648. 1892; B. P. I. Bull. 226: 70. 1912.
507. *C. Vitis* (Lév.) Sacc. in Rab. Fungi Eur. 2150; Ann. Sci. Nat. Bot. III. **9**: 261. 1848, as *Septonema Vitis* Lév.; Syll. Fung. **4**: 458. 1886, as *C. viticola* (Ces.) Sacc.; Hedw. **24**: 206. 1885; Elisha Mitchell Sci. Soc. Jour. **8**: 56. 1892, as *C. viticola* (Ces.) Sacc.; B. P. I. Bull. 226: 34. 1912.
508. *C. vulpinae* Ell. & Kell. Jour. Myc. **3**: 127. 1887; Syll. Fung. **10**: 638. 1892.
509. *C. Weigelae* Ell. & Ev. Acad. Phila. Proc. **1893**: 170. 1893; Syll. Fung. **11**: 628. 1895.
510. *C. xanthicola* Heald & Wolf, Myc. **3**: 20. 1911; B. P. I. Bull. 226: 91. 1912.
511. *C. Xanthoxyli* Cooke, Grev. **12**: 30. 1883; Syll. Fung. **4**: 465. 1886; Jour. Myc. **1**: 34. 1885.
512. *C. Xyridis* Miles, Myc. **18**: 168. 1926.
513. *C. Zeae-Maydis* Tehon & Daniels, Myc. **17**: 248. 1925.
514. *C. zebrina*[1] Pass. Hedw. **16**: 124. 1877; Syll. Fung. **4**: 437. 1886; Jour. Myc. **1**: 39. 1885; Wisc. Acad. Trans. **17**: 892. 1914; *l. c.* **21**: 294. 1924; Myc. **16**: 125. 1924.
515. *C. Zinniae* Ell. & Mart. Jour. Myc. **1**: 20. 1885; Syll. Fung. **4**: 443. 1886; Elisha Mitchell Sci. Soc. Jour. **8**: 42. 1892.
516. *C. Ziziae* Ell. & Ev. Jour. Myc. **3**: 16. 1887; Syll. Fung. **10**: 625. 1892; Wisc. Acad. Trans. **9**: 168. 1892; *l. c.* **17**: 893. 1914.

[1] Note from Wisc. Acad. Trans. **21**: 294. 1924: "The publication of this name seems to antedate that of *C. helvola* Sacc." but Davis in *l. c.* **19**: 675. 1919, notes that "*C. zebrina* Pass. is referred to *C. helvola* Sacc. as a variety by Ferraris (Fl. Ital. Crypt. **1**: 8, 423)."

Host Families and Their Cercosporas

The name of the family is followed by a number which refers to the species number as given in the "Index to Species of Cercospora."

Acanthaceae—118, 145.
Aceraceae—326.
Alismaceae—15, 352, 421.
Amaranthaceae—7, 16, 63, 73, 124.
Amaryllidaceae—20, 354.
Anacardiaceae—53, 250, 405, 406, 480.
Anonaceae—41.
Apocynaceae—32, 330, 401.
Aquifoliaceae—246, 247, 390.
Araceae—70, 352, 465.
Araliaceae—22, 47, 269.
Asclepiadaceae—40, 54, 66, 100, 164, 225, 248, 249, 494, 503.
Begoniaceae—*C.* sp.
Berberidaceae—85, 376.
Bignoniaceae—75, 82, 159, 261, 451.
Boraginaceae—228.
Campanulaceae—161.
Capparidaceae—102, 119.
Caprifoliaceae—27, 83, 140, 147, 264, 464, 476, 491, 509.
Caryophyllaceae—315, 316.
Celastraceae—143, 177, 303.
Chenopodiaceae—26, 55, 157, 191.
Compositae—1, 12, 13, 25, 36, 43, 45, 52, 56, 68, 80, 93, 95, 98, 101, 106, 148, 155, 162, 165, 171, 176, 178, 184, 197, 213, 214, 219, 221, 226, 227, 238, 259, 291, 301, 310, 335, 339, 340, 342, 351, 361, 383, 395, 396, 398, 409, 419, 432, 443, 444, 458, 466, 467, 481, 488, 498, 502, 510, 515, 522.
Convolvulaceae—*C.* sp., 14, 120, 252, 461, 486, 505.
Cornaceae—121, 122, 202, 211, 338.
Crassulaceae—429, 430.
Cruciferae—39, 46, 59, 129, 173, 268, 325, 521.
Cucurbitaceae—*C.* sp., 99, 131, 161.
Cyperaceae—77, 78, 125, 309.
Dioscoreaceae—151, 336.
Dipsaceae—167.
Ebenaceae—44, 152, 153, 192, 196, 257.
Elaeagnaceae—163.
Ericaceae—37, 168, 169, 203, 258, 350, 453.
Euphorbiaceae—3, 4, 38, 73, 74, 81, 126, 127, 128, 179, 180, 181, 234, 251, 254, 297, 298, 388, 389, 410, 457.
Fagaceae—290, 379.
Gentianaceae—182, 206, 207, 329, 420.
Geraniaceae—67, 208.
Gramineae—13, 69, 160, 199, 215, 321, 347, 355, 427, 431, 437, 439, 440, 452, 460, 470, 490, 513.
Hamamelidaceae—485.
Hydrophyllaceae—324.
Hypericaceae—244.
Juglandaceae—224, 255.
Labiatae—166, 184, 253, 267, 284, 299, 306, 328, 395, 423, 428, 456, 471.
Lauraceae—*C.* sp., 345, 393, 447.
Leguminosae—47, 73, 89, 90, 91, 103, 109, 112, 115, 130, 134, 136, 139, 141, 142, 156, 174, 175, 187, 190, 200, 212, 223, 229, 230, 245, 263, 265, 266, 270, 278, 281, 282, 300, 302, 317, 320, 334, 341, 345, 357, 363, 364, 365, 371, 384, 445, 446, 469, 475, 477, 487, 493, 500, 501, 507, 514, 520.
Liliaceae—42, 84, 113, 193, 231, 294, 447, 448, 449, 459, 462, 489.
Linaceae—274.
Lobeliaceae—162, 277.
Loganiaceae—478.
Lythraceae—21, 137, 286, 287, 331.
Magnoliaceae—276, 293.
Malvaceae—2, 17, 18, 19, 64, 217, 236, 237, 260, 295, 314, 441, 517.
Marantaceae—473.
Martyniaceae—55.
Melastomaceae—176.
Meliaceae—271, 304.
Menispermaceae—305.
Moraceae—61, 185, 186.
Myricaceae—148, 154, 323, 359.
Nyctaginaceae—313, 349.
Nymphaeaceae—183, 327, 337.

Addenda

Althaea rosea Cav.

517. *C. nebulosa* Sacc. Nuovo Giorn. Bot. Ital. **8**: 189. 1876; U. S. D. A. Bull. 1366. 1926.

Celtis?

518. *C. Spegazzinii*[1] Sacc. Syll. Fung. **4**: 475. 1886; Fung. Fl. Kansas p. 10. 1927.

Delphinium spp.

519. *C. Delphinii* Thuem. Bull. Soc. Imp. Nat. Moscou **55**: 75. 1880; Syll. Fung. **4**: 432. 1886; U. S. D. A. Bull. 1366. 1926.

Glycine Max Merr.

520. *C. diazu* Miura, Bull. So. Manchurian Ry. Co., Agr. Exp. Sta.[2] **11**: 1921; Jour. Agr. Res. **33**: 393. 1926; *l. c.* **36**: 827. 1928.

Martynia louisiana Mill.

521. *C. decolor*[1] Pass. Syll. Fung. **4**: 448. 1886; Fung. Fl. Kansas p. 8. 1927.

Solidago serotina Ait.

522. *C. fulvescens* Sacc. Nuovo Giorn. Bot. Ital. **8**: 189. 1896; Syll. Fung. **4**: 445. 1886; Fung. Fl. Kansas p. 9. 1927.

[1] The original citations have not been available for verification and are therefore omitted.

[2] The English abstract in the Jap. Jour. Bot. **1**[1]: (9). 1922, indicates this as the original place of description.

STUDIES ON THE GROWTH OF ROOT HAIRS IN SOLUTIONS

IX. The pH-Molar Rate Relation for Collards in Calcium Nitrate

CLIFFORD H. FARR

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A preliminary study of the growth of root hairs of collards in calcium nitrate, reported in No. II of this series,[1] represented an attempt to analyze the effect produced by increasing the concentration of the salt in the culture solution. The two separable factors in evidence were the chemical effect of the salt and the osmotic effect of the solution. In a solution containing 0.003 *M* sucrose, in addition to the optimum concentration of calcium nitrate, there was the same amount of retardation in growth that was obtained through the addition of an equimolar concentration of calcium nitrate. If, however, these additions were made to sub-optimal concentrations of calcium nitrate, there was a decrease in the percentage of retardation due to sucrose and a positive acceleration upon the addition of equimolar amounts of nitrate. It seemed probable therefore that the effect of osmotic pressure alone was retardation, but that in this latter instance it had been overcome by the stimulative property of the calcium nitrate up to a certain concentration.

[1] Farr, C. H. Studies on the growth of root hairs in solutions.
I. The problem, previous work, and procedure. Am. Jour. Bot. **14:** 446–456. *f. 1.* 1927.
II. The effects of concentration of calcium nitrate. *Ibid.* 497–515. *f. 2.* 1927.
III. The effects of concentrations of $CaCl_2$ and $Ca(OH)_2$. *Ibid.* 553–564. *f. 3–4.* 1927.
IV. The pH-molar-rate relation for collards in calcium chlorid. *Ibid.* **15:** 6–31. *f. 5–10.* 1928.
V. Root hair elongation as an index of root development. *Ibid.* 103–113. *f. 11–15.* 1928.
VI. Structural responses to toxic pH and molar concentrations of calcium chlorid. *Ibid.* 171–178. *pl. 7–9.* 1928.
VII. Further investigations on collards in calcium hydroxide. Torr. Bot. Club Bul. **55:** 223–245. *f. 16–18.* 1928.
VIII. Structural and intracellular features of collards in calcium nitrate. *Ibid.* **55:** 529–553. 1928.

It was suggested by the author that the critical concentration represented by the optimum of the graph might be due to a limiting factor with respect to the amount of calcium which could be absorbed from the solution, modified by the negative effect of the osmotic pressure. The nitrate ion was mentioned as a possible controlling agent in the determination of the amount of calcium absorbed. The addition of calcium nitrate above the optimal concentration could not, then, increase the rate of growth, and the retardative effect of osmotic pressure was shown in the downward slope of the curve. The sharp break in the curve in the region of optimum concentration marked the point where the accelerative effect of calcium nitrate ended and the retardative effect of osmotic pressure began. The gradual slope of the curve in solutions of still higher osmotic pressure was thought to be due to the gradual adjustment of the root hairs to the solutions.

Because of the peculiar relationship of calcium to the growth produced in solutions of varying acidity or alkalinity, it became necessary to determine the pH of every solution used. The present study represents a more complete observation of the behavior of the root hairs in different concentrations of calcium nitrate in hydrogen-ion concentrations varying from 3.5 to 12.0.

The experiments were carried on at the Marine Biological Laboratory, Woods Hole, Mass. The methods and procedure were essentially the same as those described in paper No. IV, of the series noted above. In this present study, however, buffer solutions were obtained which would cover more completely the upper part of the pH range in order to increase the accuracy of the colorimetric determinations from pH 9.5 to pH 12.0. To the series of indicators previously used there were added Brom Cresol Green, Nitro Yellow (pH 10.0–11.6), and Sulpho Orange (pH 11.0–12.6). The entire series of standard solutions with the respective indicators were placed upon a rotating table in order to increase the facility and rapidity with which the colorimetric determinations could be made. Pyrex glass tubing, stop-cocks, and separatory funnels were used as well as the Pyrex flasks for the solutions. A filter pump was employed for aeration instead of the aspirator bottles used formerly. Solutions of the desired concentration of calcium nitrate were prepared from a 0.5 *M*

stock solution, and the acidity or alkalinity was adjusted to the desired point by the addition of either nitric acid or calcium hydroxide.

pH	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5
0.100			13.4						18.4					1.1		
0.060		16.6			26.6		25.6				25.9				8.6	
0.030			11.0		34.0		51.3		51.5		30.0	27.3		32.1	28.4	0.0
0.020		12.3			17.2		39.7		62.2		31.6		47.0		25.8	
0.012	0.0		56.2		54.9		72.5		53.9		27.6		54.7	41.6	7.9	
0.008		15.5			64.4		54.7		76.1		57.8		26.3	21.8		
0.004			14.1		53.2		54.2	72.1	64.1		59.2		61.3		49.5	0.0
0.000							0.0	51.0	62.9	39.6	45.2	36.9	85.6		37.4	4.5
Mols.																

TABLE I

Average root-hair elongation in calcium nitrate.

In table I is given a summary of the average rate of root-hair elongation in concentrations of calcium nitrate varying from 0.004 M to 0.100 M and covering a pH range of 4.0–11.5. This same data is presented in more graphic form in fig. 1. A com-

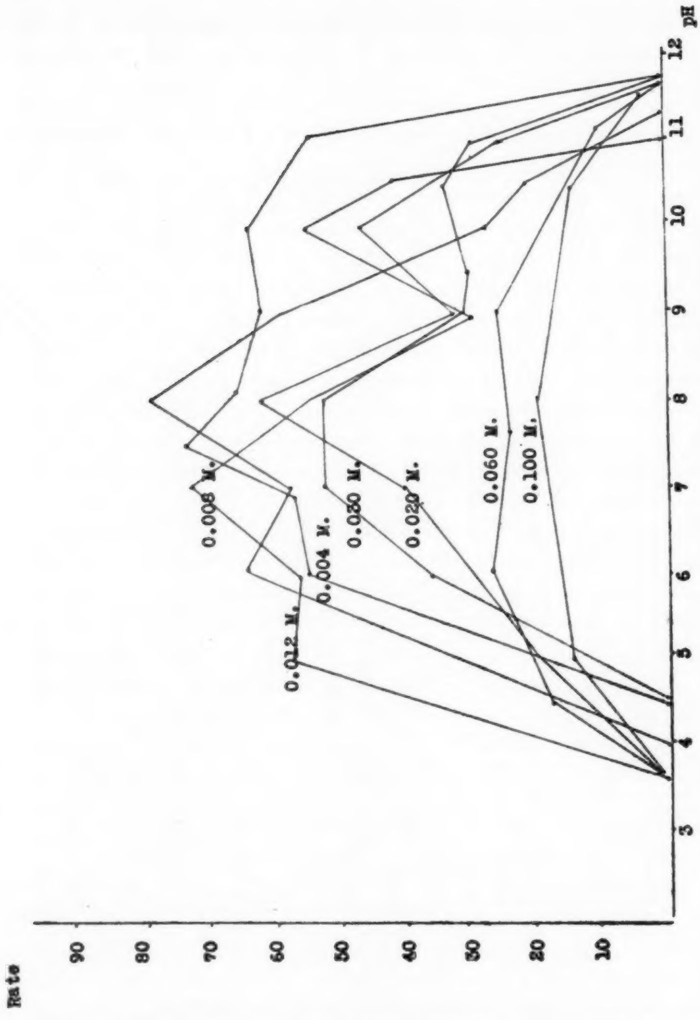

Fig. 1. Average rate of root-hair elongation in calcium nitrate.
C. H. Farr, 1927.

parison of these results with those obtained in solutions of calcium chloride under similar conditions shows a very close agreement. The pH range covered is essentially the same. All curves for the average rate of root-hair elongation in calcium chloride were

bimodal with the exception of those in the higher concentrations. These were monomodal in form. In calcium nitrate there are three types of curves, the trimodal in lower concentrations, the bimodal in median concentrations, and the monomodal in higher concentrations. Increase in the concentration of the salt brought about a decrease in the range of acidity and alkalinity which would support growth in both calcium chloride and calcium nitrate. The highest average rate of growth in calcium chloride occurred at a concentration of 0.008 *M* and at a pH of 7.9. The highest average rate of growth in calcium nitrate occurred at a concentration of 0.008 *M* and at a pH of 8.0. The numerical value of this highest average rate in calcium chloride is 88.4, in calcium nitrate, 76.1. This tendency in all solutions of calcium chloride to support a slightly higher rate of growth than that which took place in equimolar solutions of calcium nitrate is obvious. The difference is so small, however, that it may be of no significance. It will be discussed in another connection later.

The maximum rates of root-hair elongation are summarized in table II. These values are obtained from the highest rate of growth attained by any root hair at the pH indicated in the solutions of various concentrations. In calcium nitrate the most rapid growth occurred at a concentration of 0.012 *M* at a pH of 7.0. Similar data in solutions of calcium chloride show the most rapid growth of any individual hair to have taken place at a concentration of 0.020 *M* and at a pH of 6.9.

Many considerations in connection with these curves become clearer when they are presented in terms of three dimensions (fig. 2). This model is based upon fig. 1 and the curve for growth rate in calcium hydroxide. The median or neutral optimum found in calcium nitrate is shown here to be slightly zig-zag. It may be assumed, however, that if the data had been obtained at a pH of 7.5 instead of at 7.0 and 8.0 in the median concentrations that this would have been a straight line also.

The idea advanced in previous papers of the series that the rate of elongation of the root hairs represents an accurate index of the development of the root in general is further substantiated by the findings in solutions of calcium nitrate. Four factors may be compared with respect to the influence of the salt and the pH

of the solution, at each of the concentrations used. In a low concentration of calcium nitrate (0.004 *M*) a fairly close correspondence is found between root and root-hair elongation (fig. 3). The upper curve represents the maximum rate of root-hair elon-

pH	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5
0.100			26.2						28.1					2.2		
0.060		35.8			42.0		37.4				39.5				20.9	
0.030			34.3		59.1		69.3		90.1		58.4	56.0		46.7	46.7	0.0
0.020		38.9			46.0		59.7		93.2		63.1		81.4		50.7	
0.012	0.0		71.8		71.5		94.7		77.7		58.1		71.5	65.3	16.6	
0.008		33.3			75.8		78.6		89.4		84.8		68.4	57.5		
0.004			41.1		69.3		67.1	83.9	83.9		80.8		87.9		76.4	0.0
0.000 Mols.							0.0	82.8	80.1	70.5	55.0	66.2	114.1		57.5	14.1

TABLE II

Maximum root-hair elongation in calcium nitrate.

gation, the next the average rate of root-hair elongation, the third is based upon root elongation, and the last upon the maximum length of root hairs. Root elongation here gives a trimodal

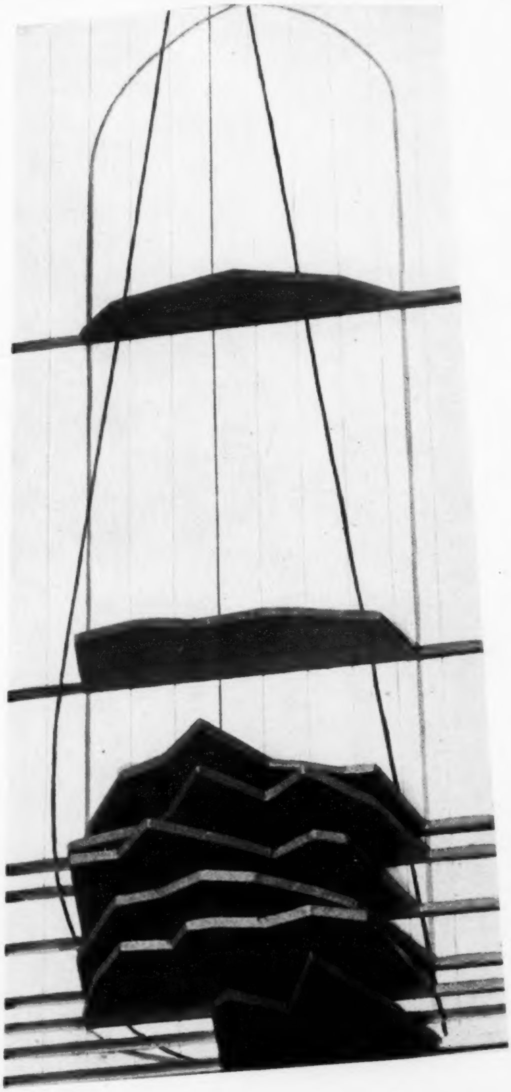

Fig. 2. Three-dimensional graph of the maximum rate of growth of root hairs of collards in calcium nitrate. Vertical parallel lines indicate pH units. Horizontal graphs refer to respective molar concentrations. Uprights represent rate of root-hair elongation. The median vertical line indicates the approximate location of neutrality. The area to the left of this line represents the acid range and the area to the right the alkaline range. The surface bounded by the broad vertical lines indicates the approximate acid and alkaline limits of growth in calcium nitrate. The surface bounded by the converging dark lines represents these same limits in calcium chloride.

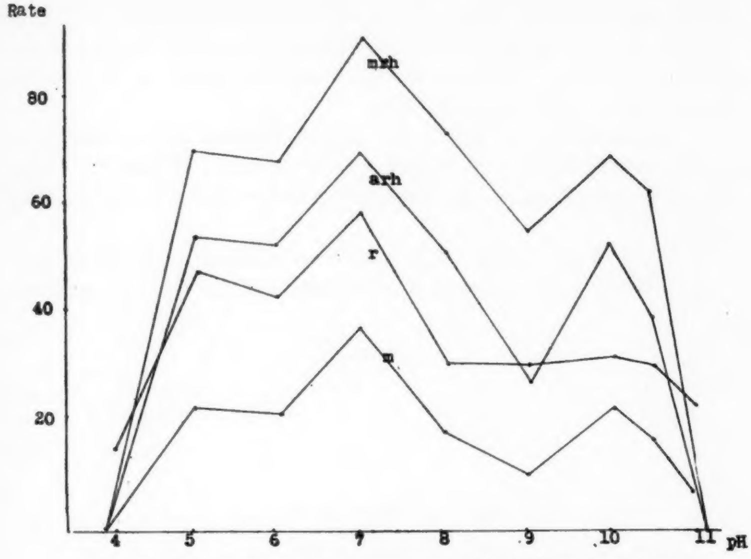

Fig. 3. Root (r) and root-hair elongation in 0.004 *M* calcium nitrate.
C. H. Farr, 1927.

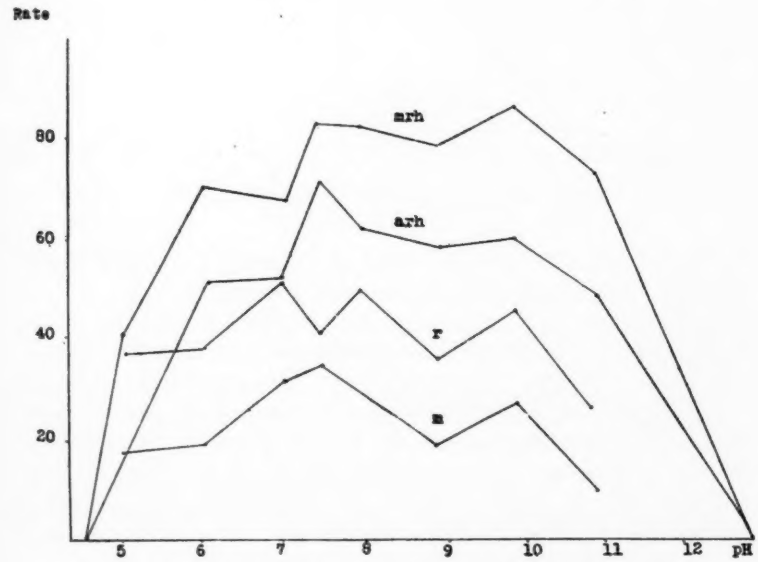

Fig. 4. Root (r) and root-hair elongation in 0.012 *M* calcium nitrate.
C. H. Farr, 1927.

curve such as was obtained for root-hair elongation. The locations of the modes do not, however, correspond except in the alkaline optima. The curve for maximum length of root hairs is bimodal at this concentration.

A concentration of 0.012 *M* calcium nitrate gives more consistent results (fig. 4). The four graphs are almost identical. The root, however, does not give as good differentiation in the alkaline solutions.

In fig. 5, based upon the results in a solution of 0.020 *M* calcium nitrate, there is again a close similarity in the four graphs.

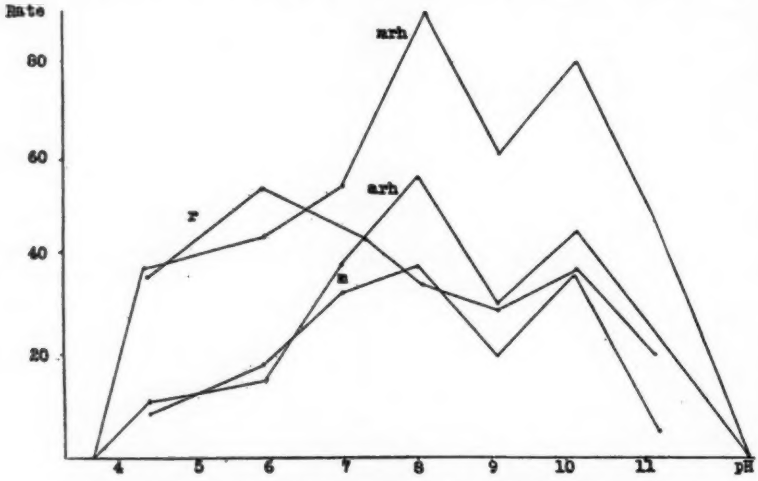

Fig. 5. Root (r) and root-hair elongation in 0.020 *M* calcium nitrate.
C. H. Farr, 1927.

In this instance, however, the acid optimum for the root is at pH 6.0 instead of at pH 8.0 as in the root-hair graphs.

In paper No. IV of this series there was presented in fig. 10 an idealized floor-plan of the three-dimensional graph for the elongation of root hairs in calcium chloride. This graph is shown again in the present study (fig. 6) for the purpose of comparison with the results in calcium nitrate (fig. 7). The median vertical lines in these floor-plans indicate the approximate locations of neutrality. The boundary lines on the right-hand sides represent the alkaline limits of root-hair elongation. The boundary lines

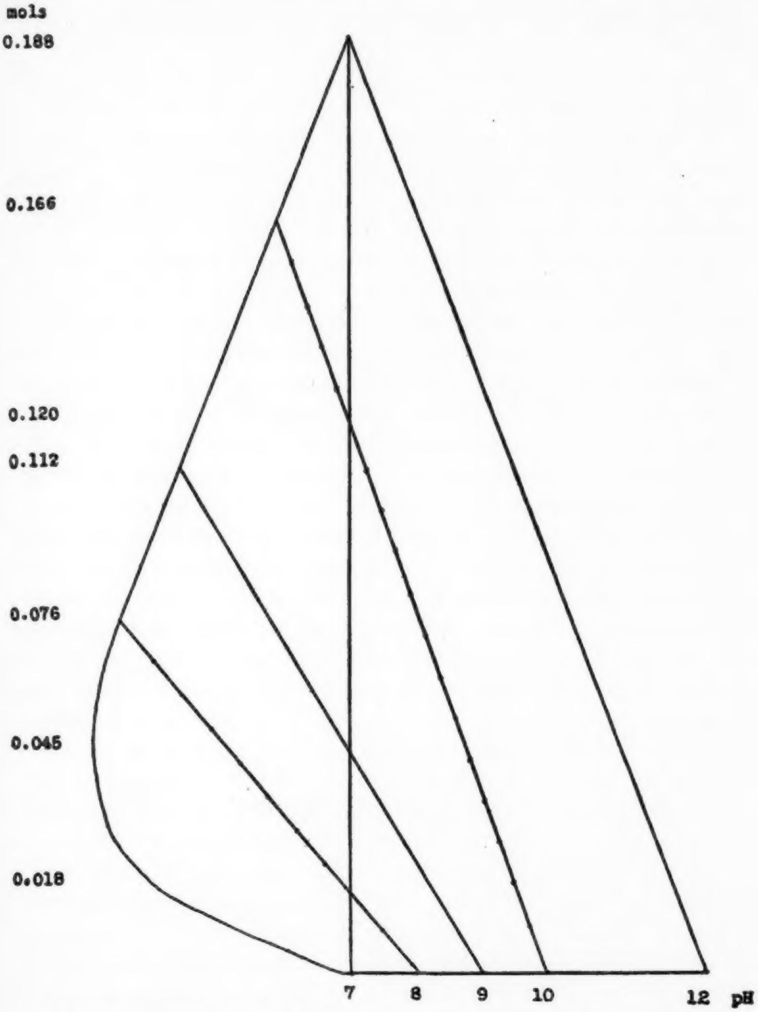

Fig. 6. Tolerance map for collards in calcium chloride solutions of different molar and pH concentrations, based on rate of root-hair elongation. Dotted lines are optima.

on the left-hand side represent the acid limits of root-hair elongation. The oblique lines near to the alkaline limits represent

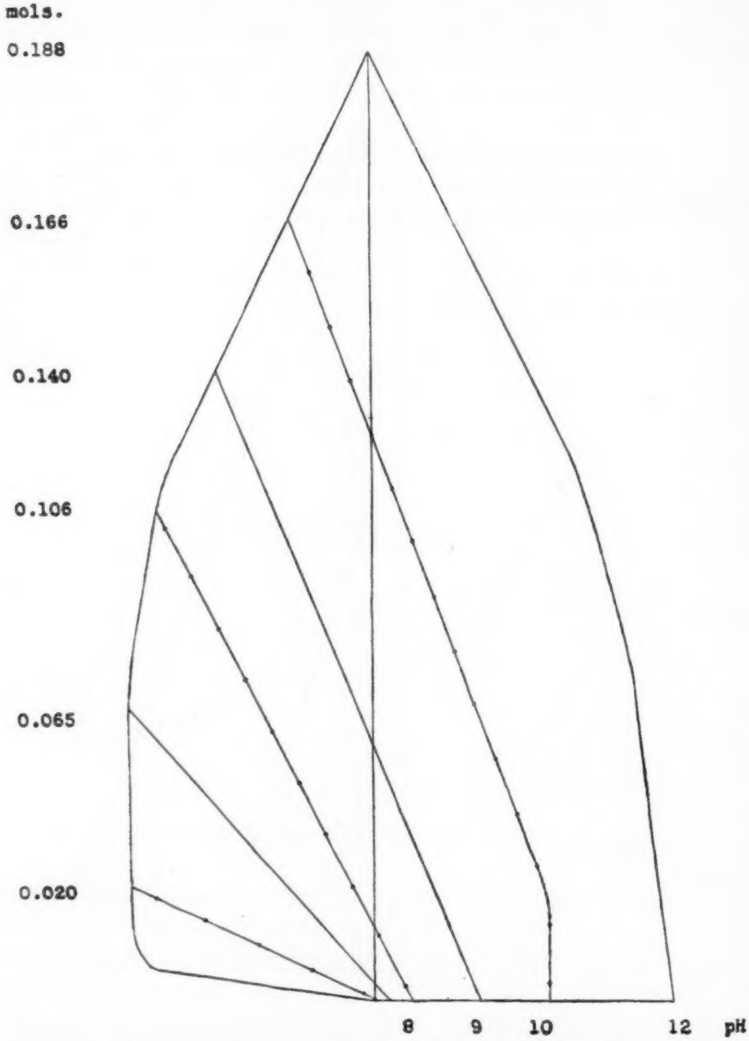

Fig. 7. Idealized floor-plan of tri-dimensional graph for calcium nitrate. Dotted line (——·——·——) indicates maxima.

the alkaline optima. The oblique lines near to the acid limits represent the acid optima. In the graph for calcium chloride the

line between the acid and alkaline optima represents the median minimum. The trimodal graph for calcium nitrate has also a neutral optimum with two minimal regions, the one on the acid and the other on the alkaline side of this central modal location. In both instances the floor-plans are seen to take the general form of an isosceles triangle, with the weak acid corner truncated and curved. It has been pointed out previously that root hairs will not grow in the absence of calcium, hence no growth would be expected in hydrochloric acid in the region represented by the projection of the base line to the left of pH 7.0. It has been known also, from various sources, that calcium antagonizes the injurious effects of the hydrogen ion. These floor-plans clearly show that very dilute calcium solutions which are only slightly acid will not permit root-hair growth. One may observe that appreciable concentrations, 0.018 *M* in the case of calcium chloride and 0.020 *M* in the calcium nitrate, will not permit the production of root hairs in solutions of pH 3.5. A graphic representation is given of the fact that the addition of lime to an acid solution or to a soil low in calcium will alter the solution so that it will support optimum growth conditions, since it changes the pH toward or to neutrality and at the same time raises the calcium content.

Some interesting relationships are brought out by superimposing the floor-plan for calcium nitrate upon that for calcium chloride, (fig. 8). Here it is seen that at most concentrations the plant will produce root hairs in a more alkaline solution of nitrate than of chloride. In weak solutions nitrate will support root-hair growth better than will chloride on the acid side of neutrality. In moderate concentrations root hairs will grow in more acid solutions of chloride than of nitrate. It is shown also that the optima of the two salts bear a definite relation to each other, and that in the nitrate, the shifting of both the acid and the alkaline optimum toward the alkaline side and the pushing of the acid limit toward lower acid concentrations make possible the insertion of a new acid optimum.

The differences which have been pointed out between the results obtained in calcium chloride and in calcium nitrate are, however, very slight and may be without significance. The effects pro-

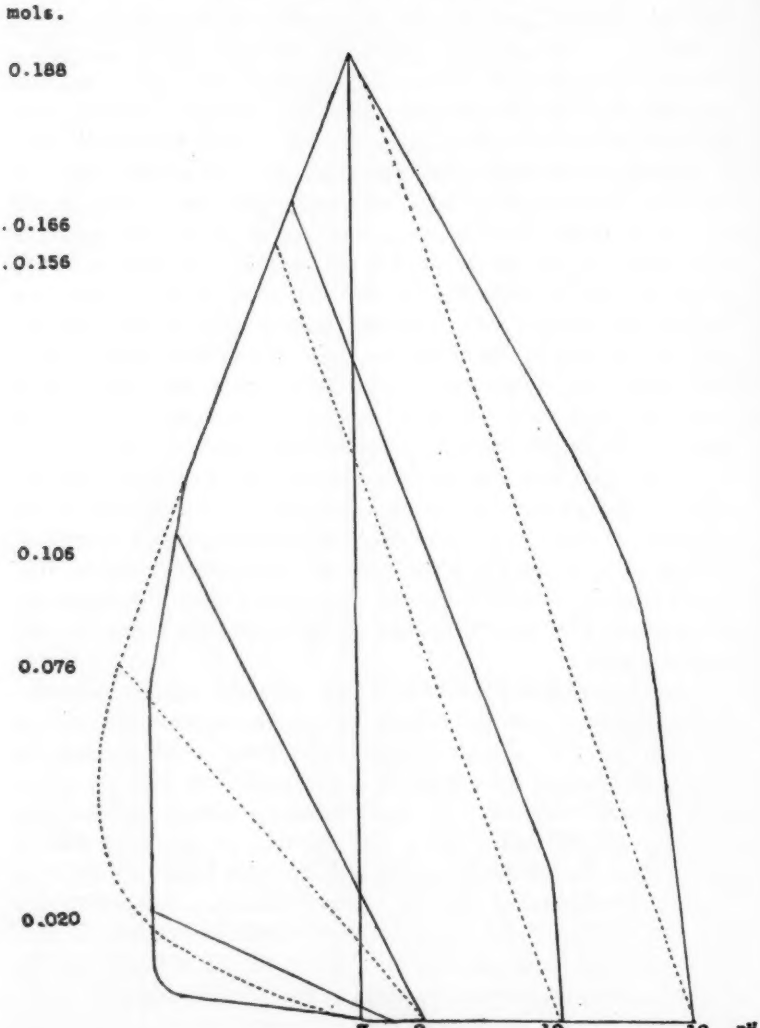

Fig. 8. Floor-plan for calcium nitrate (——) superimposed on calcium chloride (- - - -).

duced by the anions in the two instances are probably more striking because of their similarities than because of their differences.

Further analysis of the entire mass of data obtained for calcium hydroxide, calcium chloride, and calcium nitrate with respect to the possible effects of the anions concerned brings out an interesting correlation. A comparison of the data for the maximum rate of root-hair elongation may be seen in the following table:

Salt	Opt. molar conc.	pH	Max. rate elong.
$Ca(OH)_2$	0.000045	10.0	114.1 microns per hour
$CaCl_2$	0.020	6.9	109.8 microns per hour
$Ca(NO_3)_2$	0.012	7.0	94.7 microns per hour

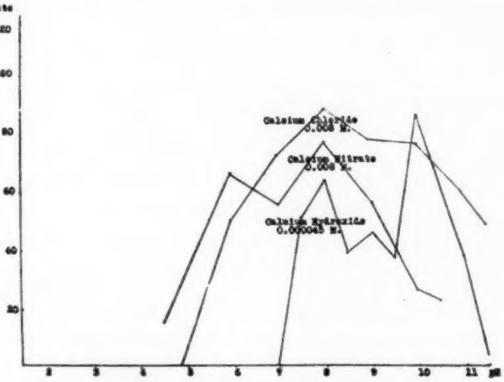

Fig. 9A. Average root-hair elongation in calcium hydroxide, calcium chloride, and calcium nitrate.

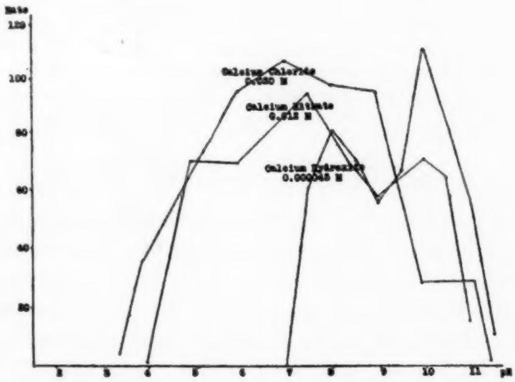

Fig. 9B. Maximum root-hair elongation in calcium hydroxide, calcium chloride, and calcium nitrate.

It is surprising to find that the maximum rate of growth occurred in a 0.000045 *M* solution of calcium hydroxide, noted earlier in No. IV of the series, while the next highest rate of growth occurred in a 0.020 *M* solution of calcium chloride. The latter solution was over 400 times as concentrated with respect to the common cation, calcium. While searching for a possible explanation upon the basis of the effects of the three anions, it became apparent that there is a possible correlation between the absolute velocities of the anions concerned and the different rates of elongation.

Since the solutions employed are exceedingly dilute, the calculations of absolute velocities may be based upon the transference numbers of the ions, the equivalent conductance at infinite dilution, and the Faraday. From the formula,

$$v = \frac{n_a \lambda_0}{F}$$

the values for the three anions are as follows:[1]

OH^{+} = 0.001802 cms. per second

Cl^{-} = 0.000676 cms. per second

NO^{-}_{3} = 0.000638 cms. per second

A comparison of these values with the rates of growth in solutions containing these anions shows a serial relationship which may be of no real significance, but which seems to be worthy of mention. The six curves for the maximum and average rates of root-hair elongation in calcium hydroxide, calcium chloride, and calcium nitrate (fig. 9) are no more striking, but represent the general tendency of the calcium chloride to support a higher rate of growth than did the calcium nitrate. The calcium hydroxide, while containing much less nutritive material and covering a much more narrow pH range, supported the highest rate of growth of all at a pH of 10.0. The fact that more dilute solutions of calcium chloride and calcium nitrate than the 0.020 *M* and 0.012 *M* respectively caused a reduction in growth rate indicates more strongly a possible effect of the anions concerned.

The studies now in progress of the growth rate of root hairs of collards in calcium sulphate may throw some additional light upon the anionic effect. If there is a real correlation between the absolute velocity of the anion in the solution and the rate of growth supported by the solution, the values obtained for calcium sulphate should fall between those for calcium hydroxide and calcium chloride.

WANDA K. FARR.

GENERAL OBSERVATIONS UPON THE ROOT

In addition to the measurement of root-hair elongation a record was kept, throughout the experiments, of the average increase in root length, the average increase in tip length, the length of the zone of aquatic root hairs upon both affluent and effluent sides of the root, the length of the interzone between the aquatic and amphibious root hairs upon both affluent and effluent sides, the

[1] Noyes, A. A., and Falk, K. G. The properties of salt solution in relation to the ionic theory. Am. Chem. Soc. Jour. **34**: p. 454. 1912.

average spacing of the root hairs, and the curvature of the roots in response to the different solutions used. A typical record sheet is shown in table III, in this instance the values obtained in a concentration of 0.060 *M* at pH concentrations of 5.0, 6.0, 7.0, 9.0, and 11.0. A summary of the records, representing in each instance the average of the numerical values obtained for six roots, is given for all of the concentrations studied in table IV. With few exceptions the increase in root length in the lower concentrations is seen to be low in the high acid and high alkaline ranges and to be highest in the region of neutrality. As the concentration of the salt increases, 0.020 *M* and 0.030 *M*, the antagonism of the calcium ion for the hydrogen ion asserts itself and the increase in root length in the acid solutions approaches or equals that in the more neutral solutions. The effect of toxic concentration of the salt has begun to assert itself in the 0.060 *M* solution to the extent that the root development is, in general, suppressed, although there remains an effect of the antagonism of the calcium ion for the hydrogen ion. The data above 0.060 *M* is indicative of the same conditions but it is not extensive enough to be compared with that from the lower concentrations.

The values for average increase in length of the hairless tip, table IV, measured at the beginning and at the end of the experiment each day, are rather irregular. The roots are seen to be well covered with hairs toward the tip in the more neutral solutions in every instance, however. The variations may be accounted for upon the basis of the many factors which are undoubtedly concerned, the toxicity of high concentrations of both the hydrogen and hydroxyl ions, the osmotic effects of concentration of the salt, the individual reactions of the roots studied, etc.

The length of the zone of root hairs shows more consistent results (table IV). The optimum neutral regions present, in every concentration which will permit comparisons with respect to this factor, the larger zones. The lengths of the zones upon the affluent and effluent sides of the root are more nearly equal in the acid and neutral solutions than in the alkaline. This indicates the degree of toxicity of the hydroxyl ion in high concentrations as shown by the delicate reaction of root-hair production.

The data for the presence and extent of an interzone or hair-

TABLE III

ROOT DEVELOPMENT IN CALCIUM NITRATE (0.060 *M*)

pH	Root No.	Root		Tip		Zone		Interzone		Space	Curv.	
		o	l	o	l	t	f	t	f		o	l
5	A1	5.0	9.0	1.5	4.5	0.0	0.0	1.0	1.0	10.0	f	f
	2	2.5	6.0	1.0	2.5	1.0	1.0	1.0	1.0	4.0	s	s
	3	3.0	5.0	1.0	2.0	0.0	0.0	0.0	0.0	10.0	s	s
	B1	2.0	4.0	1.5	3.5	0.0	0.0	0.0	0.0		s	s
	2	3.0	7.5	1.0	5.5	0.0	1.5	0.0	0.0		f	s
	3	4.5	8.0	1.0	2.5	1.5	0.0	1.5	1.5	10.0	f	s
6	A1	5.0	8.5	1.5	3.0	2.0	2.0	0.0	0.0	5.0	f	s
	2	4.0	7.0	1.0	3.0	1.0	0.0	1.0	1.0	—	f	s
	3	2.0	5.5	1.5	2.0	1.5	1.5	0.5	0.5	6.0	f	f
	B1	1.5	5.0	1.5	5.0	0.0	0.0	0.0	0.0	—	t	t
	2	2.0	6.0	1.0	2.0	1.5	1.5	1.0	1.5	5.0	s	s
	3	4.5	7.5	1.5	2.0	2.5	3.0	1.0	0.0	4.0	f	f
7	A1	6.0	9.5	1.5	1.5	0.5	1.0	1.5	1.0	100.0	f	f
	2	4.0	6.0	1.5	2.0	1.5	1.5	0.0	1.0	2.0	t	t
	3	2.5	5.5	1.5	2.0	1.5	2.0	1.0	0.0	4.0	f	s
	B1	2.0	5.5	1.5	2.0	3.0	3.0	0.0	0.0	8.0	t	s
	2	3.0	6.5	1.0	2.0	2.5	2.5	0.0	1.0	7.0	f	s
	3	5.5	8.0	1.5	3.0	0.3	0.0	0.7	1.0	10.0	t	s
9	A1	6.0	7.5	1.5	1.5	1.0	1.0	0.5	0.5	1.0	t	s
	2	3.5	6.0	1.0	3.0	1.0	1.0	0.0	0.0	1.0	s	s
	3	2.0	5.5	1.0	3.0	1.5	1.5	0.0	0.0	6.0	s	s
	B1	1.5	4.0	1.0	3.0	0.5	0.5	0.0	0.0	1.0	s	s
	2	2.0	6.0	1.5	3.0	2.5	2.5	0.0	0.0	5.0	s	s
	3	6.0	10.0	2.0	2.0	2.5	2.5	1.0	1.0	8.0	t	s
11	A1	5.0	7.0	2.0	2.0	1.0	1.0	1.0	1.0	2.0	s	s
	2	3.0	5.5	2.0	2.5	1.0	1.0	1.0	1.0	4.0	t	s
	3	1.5	3.5	1.0	2.5	0.0	1.0	1.0	0.5	3.0	t	s
	B1	1.5	4.0	1.0	3.0	0.0	0.5	0.5	0.0	5.0	t	s
	2	3.0	5.0	1.5	2.0	0.25	0.5	0.5	0.5	5.0	s	s
	3	4.0	5.5	2.0	2.0	0.5	1.5	1.0	1.0	3.0	s	s

Values for Root, Tip, Zone, and Interzone in terms of millimeters (1 = 3.6 mm.); values for Space in terms of microns (1 = 3.3 μ).

Zone = region of aquatic root hairs.

Interzone = hairless space between amphibious and aquatic root hairs.

Space = approximate average distance between adjacent root hairs on the horizon of the root, in microns.

Curvature = direction of curvature of the root, s, straight, t, affluent, f, effluent.

A = first chamber.
B = second chamber.
o = original length.
l = final length.
t = affluent side of the root.
f = effluent side of the root.

TABLE IV

A SUMMARY OF THE ROOT DEVELOPMENT IN CALCIUM NITRATE

Conc. *M*	pH	Root			Tip			Zone		Interzone		Curv.		
		o	l	d	o	l	d	t	f	t	f	s	t	o
0.004	5.0	4.0	7.6	3.6	1.6	2.1	0.5	3.0		0.0		4	1	1
	6.0	4.3	8.0	3.7	1.6	2.2	0.6	3.0		0.0		4	2	0
	7.0	3.0	7.3	4.3	1.2	2.2	1.0	3.3		0.2		4	1	1
	7.5	4.6	8.7	4.1	1.3	2.0	0.7	3.7		0.0		6	0	0
	8.0	3.4	8.1	4.7	1.2	2.4	1.2	3.5		0.0		6	0	0
	9.0	3.9	7.6	3.7	1.4	2.4	1.0	2.5		0.2		6	0	0
	10.0	4.0	8.8	4.8	1.4	2.2	0.8	3.0		0.2		3	3	0
	11.0	4.0	6.4	2.4	1.5	1.8	0.3	2.0		0.2		1	4	1
	11.5	3.4	4.6	1.2	1.4	3.4	1.0	0.0		—		0	5	1
0.008	4.5	3.6	6.8	3.2	1.4	2.2	0.8	0.8		0.6		4	1	1
	6.0	4.3	8.3	4.0	1.6	2.0	0.4	3.5		0.2		5	0	1
	7.0	4.3	8.1	3.8	1.5	2.1	0.6	3.2		0.3		4	1	1
	8.0	4.5	8.8	4.3	1.5	2.0	0.5	3.5		0.5		4	1	1
	9.0	3.3	7.5	4.2	1.5	2.0	3.0	1.0		0.6		4	2	0
	10.0	4.0	6.6	2.6	1.0	2.0	1.0	2.1		0.6		0	6	0
	10.5	3.6	8.6	5.0	1.1	2.0	0.9	2.0		0.0		0	6	0
0.012	4.0	2.3	4.1	1.8	1.1	2.1	1.0	—		—				
	5.0	3.2	6.4	3.2	1.3	2.4	1.1	2.9	2.9	0.08	0.16	3	1	2
	6.0	4.1	8.6	4.5	1.6	2.1	0.5	3.8	3.8	0.13	0.13	6	0	0
	7.0	4.2	10.4	6.2	1.5	2.4	0.9	4.4	4.6	0.10	0.6	6	0	0
	8.0	3.0	6.2	3.2	1.08	2.1	1.02	2.1	2.2	0.0	0.1	6	0	0
	9.0	4.5	7.6	3.1	1.5	1.9	0.4	1.6	1.2	0.5	0.55	4	2	0
	10.0	3.1	6.6	3.5	1.1	1.8	0.7	2.2		0.2		1	5	0
	10.5	4.4	7.6	3.2	1.5	1.7	0.2	2.7		0.6		0	6	0
	11.0	4.1	6.5	2.4	1.4	1.6	0.2	1.08	0.54	0.5	1.08	3	3	0
0.020	4.5	3.6	7.6	4.0	1.8	3.3	1.5	0.76	0.76	1.1	1.0	5	0	1
	6.0	4.1	7.6	3.5	1.5	2.6	1.1	2.6	2.6	0.3	0.3			
	7.0	3.5	8.3	4.8	0.7	1.6	0.9	3.0	2.8	0.0	0.13	6	0	0
	8.0	4.0	7.8	3.8	1.6	2.2	0.6	3.98	3.13	0.4	0.2	5	0	1
	9.0	3.8	6.5	2.7	1.3	2.08	0.78	1.3	2.2	0.0	0.0	2	2	0
	10.0	3.8	6.8	3.0	1.6	2.1	0.5	2.3	3.0	0.2	0.0	6	0	0
	11.0	3.25	5.6	2.3	1.1	1.0	0.1	0.35	1.1	1.3	0.5	2	0	4
0.030	5.0	3.6	7.6	4.0	1.6	2.5	0.9	0.4	2.0	1.4	1.4	6	0	0
	6.0	2.2	6.4	4.2	1.1	2.8	1.7	2.2	2.2	0.0	0.0	6	0	0
	7.0	3.7	7.4	3.7	2.8	2.7	−0.1	2.6	2.7	0.3	0.4	2	3	1
	8.0	4.1	7.2	3.1	1.2	2.6	1.4	2.0	2.0	0.13	0.1	4	1	1
	9.0	3.5	6.4	2.9	1.3	2.4	1.1	1.3	1.7	0.1	0.15	6	0	0
	9.5	3.6	5.7	2.1	1.0	1.8	0.8	0.8	1.6	3.5	1.5	5	1	0
	10.5	2.6	4.8	2.2	1.1	2.0	0.9	0.6	1.1	0.4	0.3	6	0	0
	11.0	2.6	5.4	2.8	1.1	1.7	0.6	0.2	1.8	1.0	0.3	1	0	5
	11.5	2.6	5.4	2.8	1.3	1.4	0.1	0.0	0.3	0.5	0.5	2	3	1

TABLE IV—*Continued*

Conc. *M*	pH	Root			Tip			Zone		Interzone		Curv.		
		o	l	d	o	l	d	t	f	t	f	s	t	o
0.060	5.0	3.3	6.6	3.3	1.1	3.8	2.7	0.25	0.25	0.58	0.58	5	0	1
	6.0	3.1	6.6	3.5	1.3	2.8	1.5	1.2	1.3	0.58	0.5	3	1	2
	7.0	3.8	6.8	3.0	1.4	2.1	0.7	1.55	1.66	0.53	0.5	4	1	1
	9.0	3.5	6.5	3.0	1.3	2.6	1.3	1.5	1.5	0.25	0.25	6	0	0
	11.0	3.0	5.1	2.0	1.6	2.3	0.7	0.46	0.91	0.83	0.66	0	6	0
0.100	5.0	2.2	3.1	0.9	1.2	1.3	0.1	0.6	0.6	0.5	0.5	5	1	0
	8.0	4.2	5.5	1.3	1.3	1.75	0.45	0.62	2.0	0.50	0.54	5	0	1
	10.5	4.0	5.5	1.5	1.3	1.2	−0.1	0.46	0.54	0.6	0.6	5	1	0
0.120	7.0	3.6	4.6	1.0	1.4	1.3	−0.1	0.8	0.8	0.5	0.3	6	0	0
0.140	7.0	3.5	4.0	0.5	1.0	0.8	−0.2	0.5	0.5	0.3	0.3	6	0	0

Values for Root, Tip, Zone, and Interzone in terms of mm. (1 = 3.6 mm.).
o = original length.
l = final length.
d = l − o.
t = affluent side of the root.
f = effluent side of the root.
s = straight.
o = effluent curvature.
t = affluent curvature.

less region between the portions of the root covered by amphibious hairs and aquatic hairs will not, in every instance, support the author's explanation of the findings in calcium hydroxide (paper VII.) The interzone in these instances was believed to have been produced by an extremely rapid growth of the root, so rapid that the production of root hairs in the horizontal direction was, for a time, suppressed. In calcium nitrate solutions, however, the highest rates of increase in root length do not always correlate with the greatest extent of interzone. The results would indicate that other factors may be involved in this very conspicuous reaction. The findings in calcium nitrate with respect to the interzone would tend to support more strongly the general conclusion in paper V, in which the author explained the presence of the interzone through the temporary suppression of root-hair development, and not as a result of more rapid root elongation.

The assumption that the normal direction of root growth is straight, and that curvatures in either the affluent or the effluent direction represent reactions to toxic conditions, is well substantiated (table IV). In the neutral solutions of lower concentration the six roots, or a large percentage of them, remained straight in most cases. Here again the high concentrations of hydrogen ions seemed to be less toxic than the excessive amounts of hydroxyl ions, a smaller number of roots having shown curvature in the more acid than in the more alkaline solutions. The antagonism of the calcium ion for the hydrogen ion comes out again in solutions of 0.020 *M* and above, the roots showing little or no curvature in the most acid solutions studied in these concentrations.

It may be seen from the data in table IV that interzone formation in 0.012 *M* $Ca(NO)_3$ solutions is more extensive on the effluent side, while in 0.020 *M*, 0.030 *M*, and 0.060 *M* solutions it is more extensive on the affluent side. This reaction would seem to be a response to the degree of acidity or alkalinity of the solutions rather than to their salt concentrations. When the data for interzone formation is presented in terms of salt concentration, this tendency to greater evidence of toxicity upon the affluent side seems to be less conspicuous.

The extent of the zone of root hairs in 0.012 *M* solutions of different H-ion concentrations shows little difference upon the affluent and effluent sides. In 0.020 *M*, 0.030 *M*, and 0.060 *M* solutions, the greater length of zone is found upon the effluent side. These results confirm, in general, the author's earlier suggestion, that in toxic solutions a higher degree of injury was registered upon the affluent side in the form of the presence of an interzone, while a lower degree of toxicity is shown in the more abundant production of root hairs upon the effluent side.

A more general view of the relationship between the concentration of the salt and the various factors presented in table IV may be obtained through a further condensation of this data (table V). Every value here represents the average of the average values obtained in the hydrogen-ion concentrations of the solutions studied. A comparison of these values for root elon-

TABLE V

SUMMARIZATION OF THE DATA GIVEN IN TABLE IV, TO BRING OUT THE EFFECT OF CONCENTRATION OF THE SALT

Conc. M	Root length	Tip length	Zone t	Zone f	Interzone t	Interzone f	Space
0.004	3.6	0.8	2.7		0.1		5.8
0.008	7.5	1.0	2.3		0.40		5.9
0.012	3.4	0.67	2.64	2.5	0.26	0.42	5.5
0.020	3.4	0.78	2.04	2.2	0.47	0.30	6.2
0.030	3.09	0.92	1.1	1.7	0.80	0.50	6.8
0.060	2.9	1.4	1.09	1.1	0.5	0.60	4.4
0.10	1.2	0.15	0.56	1.04	0.50	0.50	2.3
0.120	1.0	−0.1	0.80	0.80	0.50	0.30	2.0
0.140	0.50	−0.2	0.50	0.50	0.30	0.30	1.0

gation with those for root-hair elongation in different concentrations of calcium nitrate (fig. 2, paper II), brings out again the tendency to a more delicate reaction by the root hairs than is shown by the root as a whole. The optimum concentration for root elongation, 0.008 *M*, falls near to the optimum for root-hair elongation, 0.012 *M*. The differentiation upon either side of these optima is greater, however, in the root hair than in the root. The data for tip length show that the largest total amount of surface was covered by hairs at a concentration of 0.012 *M*, a point well within the range of solutions which maintained the best conditions for growth of root hairs as well as roots. The values in 0.120 and 0.140 *M* again represent such a limited amount of data that they may be omitted in this comparison. The highest value for the extent of the zone of root hairs occurs at 0.004 *M*, is maintained near to this point in 0.008 *M* and 0.012 *M*, and then declines gradually with a slight increase at 0.120 *M*. The extent of the interzone shows a greater tendency to fluctuate with change in concentration. It is of especial interest to observe the apparent lack of effect of concentration of the salt with respect to unequal growth of root hairs upon the affluent and effluent sides of the root, as shown by the data from the zones and interzones. The values upon the two sides show very little difference, and these differences are not consistent with the findings in solutions of toxic hydrogen- and hydroxyl-ion concentrations reported earlier

by the author. It will be remembered that the greater effect of toxicity in all of the latter type of solutions studied appeared upon the affluent side. The spacing of root hairs is also quite constant in all concentrations which will permit comparison. The values in this connection would undoubtedly be much higher in concentrations from 0.10 *M* to 0.140 *M* if the experiments had covered a range of solution of varying degrees of acidity and alkalinity comparable to that in lower concentrations.

The marked effect of hydrogen-ion concentration of nutrient media upon a wide variety of organisms continues to appear from many sources. Herčik (205) has recently reported a series of experiments upon root elongation in *Pharbitis*, with methods similar to those used in the present study. Weak buffer solutions of primary and secondary sodium phosphate (M/100) were allowed to flow over the roots. To increase the acid N/10 H_3PO_4 was added, and to increase the alkali N/10 tertiary sodium phosphate was added. Electro thermal regulation at 20° C. was maintained in a darkened under-ground room. All of the material for study was prepared in the same place under the same conditions of light, humidity, and temperature. The seedlings were grown in solutions of a definite hydrogen-ion concentration and then transferred suddenly to solutions of differing degrees of acidity. The change in rate of growth was noted every 3 to 5 minutes for 25 minutes. It is interesting to observe the similarity of the curve of permanent growth so obtained to the curve which was shown by the author for collards in a solution of 0.060 *M* calcium chloride, the acid and the alkaline optima, in both instances, falling at 5.8 and 7.6 respectively with the median minimum at 6.2.

Pantin (211), studying the growth of Amoeba in hay infusions ranging in pH values from 5 to 9, found that they thrive best at a pH of 8.2. A bimodal curve was obtained with a median minimum at a pH of 7. Taylor states that amoebae live between pH 3 and pH 8, but thrive best at pH 6.6. Hopkins (206), in a later paper, has given a fuller treatment of the effect of hydrogen-ion concentration upon growth and reproduction in Amoeba. Marked reactions to slight changes in pH were found.

At a pH of 7.2 all were dark and spherical. At a pH of 7.4 nearly all were again normal in appearance, moving about and feeding actively, and at a pH of 7.6 they were larger and more numerous. When the hydrogen-ion concentration had dropped to pH 7.8 the amoebae again became dark and sluggish, but not spherical. Further study of the relation between behavior and hydrogen-ion concentration resulted in a bimodal curve with acid and alkaline optima at pH 6.6 and 8.0–7.6, with a median minimum at about pH 7.1. In explanation of the phenomena the author relies upon the idea of changes in permeability of the membranes due to different hydrogen- and hydroxyl-ion concentrations of the solutions. With the increase in permeability to the salts, an increase in the internal osmotic pressure takes place, and consequently an increase in the water content of the amoeba and a decrease in the rate of locomotion.

Recent studies by Loo (209) on the effect of different pH concentrations upon the growth of seedlings further substantiate the idea of the antagonism of calcium ions for hydrogen ions. His experiments extended over an 8-day period, the seedlings having been introduced into the culture solution when the shoots were 3–9 cms. long. In the presence of calcium ions wheat grew fairly well in a pH of 3 or 4. In the absence of calcium this degree of acidity retarded the growth. Kaho (207), in a study of the roots of legumes, has found that K, Na, NH_3, and Mg injury in a short time begins to kill the roots. The root tip becomes slimy, and the growing zone becomes glassy and transparent. This is accompanied by a cessation in growth of the stem and a drying-up of the heads. The addition of calcium, however, inhibits most of these toxic effects.

A discussion of the necessity for the presence of calcium in connection with the development of many organisms was taken up in an earlier paper of the series (I). It is quite generally believed that its absence leads to the destruction of the cell. It has been considered to be an important component of chloroplasts, nuclei, and membranes in the form of compounds of plastin, nuclein, calcium pectate, callose, etc. Hansteen-Cranner (203), studying the effects of pure salts, found that the cause of toxicity of the salt is not in the structural change of the in-

terior of the cell but in the surface effect. The amount of calcium needed to counteract injurious effects of various salts varies greatly. The quantity needed to overcome the effect of the magnesium ion was far in excess of that needed to antagonize the potassium ion. Sokoloff (201), in a discussion of the dying and super-active (neoplastic) cells to be found in cancer tissue, attributes the rejuvenation in the latter, as shown by their nucleo-plasma ratio, mitochondria, glycogen content, etc., to an alteration of the cellular membrane and cellular lipoids. Nuclear changes, he considers to be secondary in producing the unusual behavior and mentions the possibility that the pathogenic elements may be outside the cell in the lymphoid elements. An interesting study of the relation of calcium to the plasma membrane of eggs of *Arbacea* and *Stentor* has been made recently by Heilbrunn (204). When the eggs were crushed it was observed that, in some instances, films were formed about the extruded cytoplasm, while in others there were no films produced. A series of experiments which followed demonstrated that the film was not due to adsorbed lipoids; that calcium was necessary for the reaction; that magnesium and barium could not be substituted for calcium; that the membrane formed in the absence of calcium is due to the presence of "Ovothrombin"; that the ovothrombin is probably made up of calcium and pigment granules; that the calcium may be in loose combination with a lipoid substance; and that it is freed when the lipoid substance breaks down.

The accumulation of larger amounts of data dealing with simple ionic effects upon various organisms will undoubtedly lead to a clearer understanding of the real nature of the factors concerned in growth. With respect to the rate of root-hair elongation and the other points of interest in root development which have been discussed there has been found to be little difference in the roots of collards grown in calcium nitrate and those grown in calcium hydroxide and chloride. The morphological changes in root hairs have shown greater contrasts in the different salt solutions used and have been treated in a separate paper (VIII).

Moravek (210) has attempted to gain a clearer understanding

of the growth conditions in root hairs by observing the growth of structures formed by the reaction on the boundary between solutions of electrolytes in water and those in a gel. Upon a solidified 0.1 N solution of potassium dichromate in 5 per cent gelatin was placed a layer of 0.1 N solution of lead nitrate. Fibrous structures 0.1 to 0.3 mm. wide grew out into the latter. Their walls were formed by a gelatin membrane with precipitated lead chromate. A stream proceeded through the fiber from the gelatin layer, meeting the lead nitrate solution at the tip of the fiber. A precipitated gelatin layer in the form of a membrane upon which lead chromate is deposited discontinuously grew with a maximal velocity of 0.16 mm. per minute. The chief growth directions are vertical and horizontal. The growth velocity and the dimensions and the shape of the fibers were influenced by the concentration of the gelatin, the addition of calcium or potassium ions, and the raising of the temperature above 32° C. Light intensity seemed to exert no influence. The cause of the growth in the fiber was attributed to the diffusion stream. This conclusion is entirely in keeping with the findings and interpretations of the author in connection with the diffusion streams in root hairs of collards and discussed in another paper dealing with morphological changes in root hairs of collards on solutions of calcium nitrate (VIII). From observations upon the development of twin hairs, in which the movement of the nucleus into one branch of the hair was accompanied by cessation of growth in that branch, the idea was advanced that the retardation had been caused by the blocking of the diffusion stream by the nucleus.

Conclusions

1. Improvements in the methods of determination of the hydrogen-ion content of the solutions used are described.

2. The curves for the rate of root-hair elongation of collards in dilute solutions of calcium nitrate are shown to be trimodal in contrast to the bimodal curves obtained in calcium chloride.

3. The curves for the rate of root-hair elongation in median concentrations of calcium nitrate are seen to be bimodal, as are those obtained in all except the most concentrated solutions of calcium chloride.

4. The curves for the rate of root-hair elongation in solutions of higher concentrations are monomodal, as were the curves in high concentrations of calcium chloride.

5. The three-dimensional graph from solutions in calcium nitrate shows in dilute solutions, therefore, three optima and two median minima, or perhaps the latter should be called the acid minimum and the alkaline minimum.

6. The median or neutral optimum is shown to be slightly zig-zag. It may be assumed, however, that if the data had been obtained at pH 7.5 instead of at pH 7.0 and 8.0 in the median concentrations that this would have been a straight line also.

7. A floor-plan of the three-dimensional graph for calcium nitrate bears comparable relationships to the limits that were found in calcium chloride.

8. The comparison which may be made by superimposing the one floor-plan upon the other shows that the plant will produce root hairs in a more alkaline solution in nitrate than in chloride.

9. In weak acid solutions nitrate will support root-hair growth better than will chloride.

10. In moderate concentrations root hairs will grow in a more acid solution in chloride than in nitrate.

11. It may be seen that the optima for the two salts bear a definite relation to each other, and that by the shifting of them in the nitrate toward the alkaline side, and the pushing of the acid limit to the lower acid concentrations, room is developed for the insertion of a new acid optimum.

12. The curves obtained for maximum rate of root-hair elongation, for root elongation, and for maximum length of root hairs correspond quite closely to those for average rate of root-hair elongation.

13. In 0.004 *M* solutions root elongation gives a tri-modal curve such as we obtain in root-hair elongation. The locations of the modes do not, however, correspond except in the case of the alkaline optimum.

14. In 0.012 *M* solutions the graphs for the four factors are almost identical, except that the root does not give as good differentiation upon the alkaline side as do the other factors.

15. In solutions of 0.020 *M* there is again a close similarity

in the four graphs. In this instance, however, the acid optimum for the root is at pH 6.0 instead of at pH 8.0 as in the root-hair graphs.

16. In the curves for 0.030 *M* there is a correspondence of root and root-hair activity, but here again the acid optimum for the root is at pH 5.9 instead of at 6.9, as in the root hairs.

17. Curves for 0.060 *M* solutions show a similar correspondence of root and root-hair activity except that, in this case, the acid optimum for the root is at 5.4, instead of at 4.4 for the root hair.

18. It thus appears that there is less variation of the acid optimum with change in concentration of the salt for the root than for the root hair. This may be correlated with the failure of the external solution to impinge its full effect upon the cells on the interior of the root.

19. A summarization of the entire mass of data obtained with reference to the increase in root length, the increase in tip length, the length of the zone of root hairs, the length of the interzone between the amphibious and aquatic hairs, and the spacing of the root hairs is made to bring out the effect of hydrogen-ion concentration in each of the salt concentrations used.

20. A further condensation of this data, so that each concentration at all of the points of acidity and alkalinity will be represented by one value, brings out the effect of salt concentration upon the various factors.

21. We have by this method a means of comparing different chemical ions as to their biological effect on a more or less accurate mathematical basis.

22. It is believed also that the method presents an accurate method of study of the specific effect of different substances upon a simple cell process, namely, cell enlargement.

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HYSTERANGIUM IN NORTH AMERICA[1]

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HYSTERANGIUM

Hysterangium Vittadini, Monogr. Tuberac. 13–15. 1831; Tulasne, Fung. Hypog. 80–85. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2, I. **1**: 878–879. 1883; DeToni in Sacc. Syll. Fung. **7**: 155–158. 1888; Hesse, Hypog. Deutschl. **1**: 94–105. 1891; Harkness, Cal. Acad. Sci. Proc. III. **1**: 254–257. 1899; E. Fischer in Engl. & Prantl, Die Nat. Pflanzenfam. I. **1****: 306. 1899; Bucholtz, Материалы къ морфологіи и систематикѣ подземныхъ грибовъ (Tuberaceae И Gastromycetes pr. p.) съ приложеніемъ описанія видовъ, найденныхъ до сихъ поръ въ предѣлахъ Россіи. Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ с. Михайловскомъ Московской Губ. **1**: 151–153. 1902 [sometimes cited as Beitr. Morph. Syst. Hypog.]; Th. M. Fries, Svensk Bot. Tidskr. **3**: 279–281. 1909; Rodway, Roy. Soc. Tasmania Papers & Proc. **1911**: 26–27. 1912; Soehner, Pilz und Krauterfreund **5**: 254–256. 1922.

Hyperrhiza Endlicher, Gen. Pl. 28. 1836 (in part).

Splanchnomyces Corda, Icones Fung. **6**: 37–45. 1854 (in part).

The type species of the genus is considered to be *Hysterangium clathroides* Vittadini in accordance with the recommendations of the Committee on Nomenclature of the Botanical Society of America, Bot. Soc. Am. Publ. 73: 70–71. 1919, since the author states that he has collected this species many times and describes it at greater length.

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Fructifications spherical, ellipsoidal, oblately spheroidal to reniform and irregular; fibrils filiform, terete or flattened, loose to innately appressed, simple or anastomosing, usually less prominent than in *Rhizopogon*, leading to rhizomorphs, usually dark-colored; peridium simple or duplex, of fibrous, parenchymatous or pseudoparenchymatous context, usually separable, indehiscent; gleba lacunose, usually tough, gelatinous-cartilaginous, penetrated from the basal attachment by a simple or dendroid columella of fibrous or pseudoparenchymatous tissue; septa fibrous or pseudoparenchymatous, often radiating from columella; basidia 1–several-spored; spores smooth (sometimes with loose epispore), typically fusiform to elongate-ellipsoidal, sometimes ovoidal, greenish, brownish or white in mass.

Hysterangium is so familiar to mycologists, and its relationships have been so fully treated by one of us[1] that its characteristics need not be discussed here. In 1831 Vittadini included in the genus hypogaeous Gasteromycetes having smooth spores and peridia which dissolve or split off at maturity. Since then the genus has been emended to include species with semi-persistent or indehiscent peridia, but its limits are characteristic and for the most part unmistakable. Cunningham's[2] genus, *Phallobata*, is closely related to *Hysterangium* through *Hysterangium Phillipsii* Harkness.

This paper describes 31 species and lists 2 doubtful and 3 excluded species. Sixteen are European, 19 North American, 4 South American, 2 African, and 7 from Australia or near-by islands. Within the United States the species are found principally along the Pacific Coast where in California and Oregon alone 15 species are reported. Three species have been found in New England, two in New York, three in Tennessee, two in North Carolina, and one each in Ohio and Wyoming.

There are 5 named varieties described. Among the 31 species, there is one newly named, 11 are here first described in Latin, of which 7 are described as new by the writers, and one new combination is proposed.

[1] Dodge, C. W. Gasteromycetes in Gäumann & Dodge, Comparative morphology of Fungi, p. 492 et seq. New York, 1928.

[2] Cunningham, G. H. A new genus of the Hysterangiaceae. New Zealand Inst. Trans. **56**: 71–73. 1926.

We have followed the plan, adopted in previous taxonomic papers, of giving the data and location of specimens cited. Unless otherwise stated, colors have been compared with Ridgway's 'Color Standards and Color Nomenclature,' Washington, D. C., 1912.

We gratefully acknowledge those who have made this work possible by putting at our disposal personal collections or the facilities of libraries and herbaria. We are indebted to the Missouri Botanical Garden for the use of its library and herbarium; to Leland Stanford Jr. University for access to the Dudley Herbarium, and to Dr. LeRoy Abrams and Professor J. McMurphy for assistance in the study of Harkness' specimens there; to Dr. P. Claussen of Marburg University for a loan of Hesse's material; to Dr. J. B. Cleland for Australian collections; to Dr. G. H. Cunningham for New Zealand material; to Harvard University for access to collections at the Farlow Herbarium, and to Dr. R. Thaxter for putting at our disposal many of his own collections, and for helpful suggestions; to the late Mr. C. G. Lloyd for the courtesies of the Lloyd Museum; to Mr. H. E. Parks for many of his collections and notes on freshly collected material; to Mr. L. Rodway for Tasmanian collections; to Drs. W. A. Setchell and N. L. Gardner for access to the herbarium of the University of California; and to Dr. Ert Soehner for authentic material of *H. Rickeni*.

Key to the Species of Hysterangium

1. Peridium wholly or in part parenchymatous or pseudoparenchymatous 2
1. Peridium without parenchyma or pseudoparenchyma....................16
   2. Gleba purplish brown (dry)......................*H. purpureum* (p. 110)
   2. Gleba brownish, yellowish or ochraceous (dry)........................3
   2. Gleba greenish (dry)...7
3. Peridium in one layer of pseudoparenchyma.............................4
3. Peridium in more or less distinct layers.................................5
   4. Peridium membranous, 400 μ or more thick ....
   ....*H. stoloniferum* and variety (p. 111, 112)
   4. Peridium compact, 120–320 μ thick..........*H. neocaledonicum* (p. 113)
   4. Peridium of larger, softer-walled cells, 90–110 μ thick....*H. album* (p. 87)
5. Both layers of peridium pseudoparenchymatous......*H. neglectum* (p. 88)
5. One layer of the peridium filamentous and one layer parenchymatous.......6
   6. Peridium 350–640 μ thick; fructifications large, 3–6 cm. in diameter; septa about 200 μ thick......................*H. occidentale* (p. 89)
   6. Peridium 240–320 μ thick; fructifications less than 2 cm. in diameter; septa 50–80 μ thick.........................*H. strobilus* (p. 90)

7. Peridium of a single layer..8
7. Peridium of more than one layer..13
8. Spores mostly 5 μ or less in length................*H. Phillipsii* (p. 91)
8. Spores 7 μ or more in length..9
9. Septa more than 70 μ thick...10
9. Septa less than 60 μ thick..12
10. Peridium separated from gleba by a definite filamentous layer........11
10. Peridium not separated from the gleba by a definite filamentous layer; septa 70–150 μ thick; peridium 120–240 μ thick......................................*H. affine* and varieties (p. 92, 93)
11. Septa less than 175 μ thick; peridium 220–450 μ thick...*H. clathroides* (p. 93)
11. Septa more than 220 μ thick; peridium 100–200 μ thick......................................*H. clathroides* var. *crassum* (p. 96)
12. Septa 12–30 μ thick; spores 7–10 μ long; peridium 320–375 μ thick......................................*H. obtusum* (p. 97)
12. Septa 45–60 μ thick; spores 12–17 μ long; peridium 65–160 μ thick......................................*H. inflatum* (p. 98)
13. Peridium more than 200 μ thick..14
13. Peridium less than 200 μ thick...15
13. Peridium 100–240 μ thick, outer layer cottony-filamentous, inner pseudoparenchymatous; spores 13–18 μ long.............*H. nephriticum* (p. 99)
14. Outer peridial layer definitely parenchymatous, 80–200 μ thick, inner layer pseudoparenchymatous; spores 8–12μ long..*H. coriaceum* (p. 113)
14. Both peridial layers parenchymatous, outer layer about 25 μ thick; spores 13–22 μ long.......................*H. crassirhachis* (p. 101)
15. Outer peridial layer pseudoparenchymatous, inner filamentous......................................*H. siculum* (p. 114)
15. Outer peridial layer filamentous, inner pseudoparenchymatous......................................*H. Harknessii* (p. 102)
16. Peridium of more than one layer..17
16. Peridium of one layer..18
17. Spores less than 6 μ long; peridium more than 1500 μ thick......................................*H. Thaxteri* (p. 114)
17. Spores more than 10 μ long; peridium less than 500 μ thick......................................*H. cinereum* (p. 103)
18. Peridium less than 60 μ thick..19
18. Peridium more than 70 μ thick..20
19. Septa 10–15 μ thick; spores 7.5–11 × 5–6 μ........*H. membranaceum* (p. 104)
19. Septa 25–60 μ thick; spores 14–15 × 4–5 μ..............*H. pumilum* (p. 115)
20. Gleba buff, brownish, yellowish or ochraceous.............................21
20. Gleba greenish...24
21. Spores less than 17 μ long; peridium mostly more than 180 μ thick........22
21. Spores 17–21 × 6–8 μ; peridium 160–180 μ thick; fructifications drying wood-brown.......................................*H. Thwaitesii* (p. 116)
22. Spores 12 μ or more long and broadly fusiform.............................23
22. Spores 12 μ or less long and narrowly fusiform; fructifications drying buckthorn-brown to mummy-brown..............*H. fuscum* (p. 105)
23. Fructifications drying ochraceous buff to russet; spores light buff in mass; gleba drying fragile..............................*H. rubricatum* (p. 105)

23. Fructifications drying buffy olive to light brownish olive; spores olivaceous in mass; gleba drying hard................*H. Pompholyx* (p. 106)
24. Peridium less than 300 μ thick..................................25
24. Peridium more than 400 μ thick..................................26
25. Spores fusiform, 10–17 × 6–7.5 μ; septa 50–120 μ thick..*H. cistophilum* (p. 107)
25. Spores fusiform, sometimes papillate, 15–18 × 6–7 μ.....*H. Rickeni* (p. 117)
25. Spores ellipsoid, 8–11 × 4–5.5 μ; septa 35–80 μ thick.....*H. Fischeri* (p. 109)
26. Spores more than 17 μ long; peridium more than 1000 μ thick...... ....*H. fragile* (p. 118)
26. Spores less than 15 μ long; peridium less than 700 μ thick............27
27. Peridium 600 μ thick, of alternate layers of light and dark brown hyphae. ....*H. calcareum* (p. 119)
27. Peridium 500 μ thick, homogeneous, yellow-spotted........*H. Petri* (p. 119)

1. **Hysterangium album** Zeller & Dodge, sp. nov.

Pl. 1, fig. 1; pl. 3, fig. 5.

Fructificationes globosae vel depressae, ad 7 mm. diametro metientes, "cartridge-buff" (Ridgway); columella dendroidea, tenuis; peridium separabile, 90–110 μ crassitudine, pseudoparenchymate hyalino, hyphis superficialibus, crystallis oxalatis incrustatis; gleba "cartridge-buff" (Ridgway) vel obscuratior; locelli magni, vacui, globosi vel irregulares; septa hyalina, 50–150 μ crassitudine, hyphis compacte contextis; basidia clavata vel ovata, ad 13 × 7–8 μ, bispora, rarius tetraspora, sterigmatibus brevibus; sporae hyalinae vel cremeae acervatae, fusiformes, papillatae, appendiculatae, 13–21.5 × 5–7 μ.

Type: in Fitzpatrick Herb., in Dodge Herb., and in Zeller Herb.

Fructifications spherical or somewhat depressed-globose, up to 7 mm. in diameter, cartridge-buff when dry; columella dendroid, small; peridium separable, 90–110 μ thick, pseudoparenchymatous, with superficial hyphae which are encrusted with oxalate crystals; gleba cartridge-buff or darker, consisting of a few large cavities in older specimens; cavities empty, rounded to irregular; septa hyaline, 50–150 μ, composed of compactly interwoven hyphae; basidia small, hyaline, clavate to ovate, 13 × 7–8 μ, usually 2-spored, rarely 4-spored; sterigmata short; spores hyaline, cream-colored in mass, smooth, broadly fusiform, usually with a papillate apex and base with short appendage, 13–21.5 × 5–7 μ.

This species seems to have close affinities with *H. neocaledonicum* Patouillard, but it differs in general color, size, and texture, and in the thickness of the peridium which is of a looser texture than in *H. neocaledonicum*.

Specimens examined:

New York: Ithaca, *H. M. Fitzpatrick, 364*, type (in Fitzpatrick Herb., Dodge Herb., and in Zeller Herb. 2800).

2. **Hysterangium neglectum** Massee & Rodway, Kew Bull. Misc. Inf. **1899**: 181. 1899; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 247. 1902; Rodway, Roy. Soc. Tasmania Papers & Proc. **1911**: 27. 1912; **1923**: 156. 1924. Pl. 3, figs. 2, 7.

Type: probably in Kew Herb. and in Rodway Herb.; cotype in Dodge Herb. and Zeller Herb.

Fructifications 1–1.5 cm. in diameter, drying to less than 1 cm., rugulose, white when fresh, drying clay color to Saccardo's umber; mycelium not seen; columella large, penetrating to the middle of the fructification, much-branched, branches penetrating to peridium; fibrils prominent, waxy, concolorous or darker; peridium 160–250 μ, not separable, duplex, the outer layer up to 80 μ, very variable in thickness, deep brown under the microscope, pseudoparenchyma of narrow, thick-walled cells; the inner layer 80–170 μ, composed of hyaline, thin-walled pseudoparenchyma, most of whose cells are periclinal; gleba subgelatinous, drying Prout's brown to bister, cavities elongate, 160–200 μ in diameter, nearly filled with spores at maturity; septa hyaline, 30–40 μ between hymenia, composed of very slender hyphae with gelatinized walls; basidia 7 × 9 μ, hyaline, oblong-pyriform with four slender sterigmata 4–5 μ long; spores smooth, broadly ellipsoid to ovoid, 14–18 × 7–8 μ, brownish, epispore thick, spores more or less stuck together by the gelatinization of walls, usually long-pedicellate.

Under *Quercus*. Oregon and Tasmania. October.

Because of the shape and color of the spores this species has about as close affinities with *Hymenogaster* as *H. inflatum* has with *Dendrogaster*.

Specimens examined:

Oregon: Linn Co., *S. M. Zeller* (in Oregon Agr. Coll. Herb. 4866, and Zeller Herb. 2583).

Tasmania: Hobart, *L. Rodway 614*, cotype (ex Massee Herb. in N. Y. Bot. Gard. Herb.); *1118* (in Lloyd Mus.); *1263*, *1266* (in Dodge Herb. 337, 349, in Zeller Herb. 7224, 7225).

3. **Hysterangium occidentale** Harkness, Cal. Acad. Sci. Proc. III. **1**: 255. 1899; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 245. 1902. Pl. 3, figs. 1, 9.

Type: cotype in Dudley Herb. at Leland Stanford Jr. Univ.

Fructifications spherical to somewhat depressed, 3 × 6 × 6 cm., of firm consistency from abundant rhizomorphic growth in soil, dirty white to pallid mouse-gray, darkening to drab or hair-brown in alcohol, fibrils few, concolorous, conspicuous, free to adnate; base not prominent; columella penetrating at least to the middle of the fructification, branched, with a cartilaginous appearance when fresh; peridium duplex, separable, 350–640 μ thick; outer layer often flaking off, 85–300 μ thick, dark brown, composed of brown hyphae in rhizomorph-like periclinal strands, loosely interwoven, clamp-connections frequent; inner layer parenchymatous, 260–400 μ thick, parenchyma not compact, characterized by long hypha-like cells, as in illustration (pl. 3, fig. 1); gleba light pink when fresh (Parks), becoming buckthorn-brown to raw umber in alcohol or when dry; cavities empty, radiating from columella; septa 200 μ thick, composed of closely woven, gelatinized hyaline hyphae; basidia linear, filiform, collapsing, 2–4-spored; sterigmata short, stout; spores yellow-brown in mass, ellipsoidal, cell wall thickened at apex, 12–16 × 5–7 μ.

Under *Quercus*. Oregon and California. Spring and early summer.

Mature plants are nearly odorless or have the pleasant odor of some species of *Polyporus*. Fruiting bodies are tough and rubbery when fresh. It is a large coarse species.

Specimens examined:

Oregon: Benton County, Corvallis, *S. M. Zeller, 7063* (in Oregon Agr. Coll. Herb. 4868, and Zeller Herb. 7063).

California: Marin County, Mt. Tamalpais, *H. W. Harkness, 242*, cotype (in Dudley Herb. at Leland Stanford Jr. Univ.); Santa Clara County, Alma, *H. E. Parks, Z26* (in Zeller Herb. 1712, and Univ. Cal. Herb. 468); Morgan Hill, *C. W. Dodge & M. S. Clemens* (in Dodge Herb. 1533 and 1534).

4. Hysterangium strobilus Zeller & Dodge, sp. nov.

Pl. 1, fig. 6; pl. 3, fig. 11.

Fructificationes subsolitariae, globosae, 1–1.5 cm. diametro metientes, siccatae minus quam 1 cm., argillaceae servatae, subalbidae siccatae; columella magna, arborea, velut strobili *Pini Strobi*, percurrens, basis rhizomorphis confecta, funiculis alteris destitutis; peridium 240–320 μ crassitudine, tenuibus hyphis 2–3 μ diametro dense compactum, hyphis exteris superficiei perpendicularibus, intus 65–120 μ, parenchymate hyalina; gleba elastica, cacaotica brunnea recens, olivacea siccata; locelli irregulares, sporis subimpleti; septa subscissilia, 50–80 μ crassitudine, magnis hyalinis hyphis gelatinosis; basidia cylindrica (an collapsa?) bi- vel tetra-spora, 12–16 × 3–6 μ; sterigmata 5–12 × 2–2.5 μ; sporae 12–16.5 × 5–6.3 μ, subfusiformes.

In fagetis, Tennessee.

Type: in Thaxter Herb.

Fructifications subsolitary, globose, 1–1.5 cm. in diameter, drying less than 1 cm., clay color in alcohol, nearly white when dry; columella large, dendroid, resembling the cones of *Pinus Strobus* when seen in section, percurrent; base of rhizomorphs but no other fibrils; peridium duplex, 240–320 μ thick, outer layer 120–250 μ, composed of slender, loosely woven hyphae 2–3 μ in diameter, with some hyphae often running perpendicular to the surface, somewhat in strands, inner layer 65–120 μ, of hyaline parenchyma, easily separable from gleba; outer layer separable from inner layer of peridium; gleba rubbery in consistency, chocolate-brown when fresh, drying olive; cavities irregular, partially filled with spores; septa somewhat scissile, 50–80 μ thick, composed of large hyaline hyphae with gelatinous walls; basidia cylindrical (or collapsed?) 2–4-spored, 12–16 × 3–6 μ; sterigmata stout, 5–12 × 2–2.5 μ; spores 12–16.5 × 5–6.3 μ, brown, subfusiform, with heavy exospore, which is rather loosely sheathing in dry specimens.

Under *Fagus*. Tennessee.

This species is most closely related to *H. occidentale* Harkn. in structure of peridium and color and texture of gleba, but it is smaller in the dimensions of all of the sterile tissues. *H. occidentale* is a larger, coarser species. *H. strobilus* is similar to *H. Harknessii* in peridial characters but differs in color and texture of the gleba.

Specimens examined:

Tennessee: Burbank, *R. Thaxter*, *B4H*, type (in Thaxter Herb.).

5. **Hysterangium Phillipsii** Harkness, Cal. Acad. Sci. Proc. III. **1**: 255. 1899; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 216. 1902. Pl. 3, fig. 26.

Illustrations: Harkness, Cal. Acad. Sci. Proc. III. **1**: *pl. 42, f. 1.*

Type: cotype in Dudley Herb. at Leland Stanford Jr. Univ.

Fructifications 3–6 cm. in diameter, ellipsoid to pyriform in shape, rose-pink (Harkness), Mars brown to warm sepia in alcohol, fibrils none; base rhizoidal-branching, very long; columella penetrating to middle of fructification, branching; peridium about 275 μ thick, of thin-walled cells which are olivaceous brown, 3–4 μ, forming a collapsed pseudoparenchyma? underlaid with a thick layer (about 400 μ) of white sterile gelatinous glebal tissue; gleba deep olive to jade-green; septa 40 μ between hymenia, hyaline; basidia, 2–2.5 × 7–9 μ, cylindric, 2-spored; sterigmata filiform, 3–4 μ; spores oblong, appendiculate, hyaline to olivaceous, 3–5 × 1–1.5 μ.

In coniferous and hard wood forests. Ohio and Pacific Coast. Spring and summer.

This species is more nearly a radicate or stipitate species than any of this genus. The basal portion, however, is a contraction of the peridium which leads to a dense mass of mycelium of white or pale pink strands. The surface of the fruiting bodies is subnitid-glabrous with small shallow pits lighter in tint than the surrounding surface. The Ohio collection was taken from the surface of a very rotten, continually wet log, where the fructifications were entirely superficial.

Cunningham's new genus, *Phallobata*,[1] surely has its closest relationship to the genus *Hysterangium*, through *H. Phillipsii*. *Phallobata* is found on decaying wood, as was the large collection of Ohio material of *H. Phillipsii*. Both are distinctly radicate and have similar spores.

Specimens examined:

Ohio: Herrouns Woods, Maumee Valley near Toledo, *W. R. Lowater*, *No. ORAN* (in Dodge Herb. 2847, Oregon Agr. Coll. Herb. 4869, and Zeller Herb. 7227).

[1] Cunningham, G. H. A new genus of the Hysterangiaceae. New Zealand Inst. Trans. **56**: 71–73. 1926.

Oregon: Corvallis, *W. H. Dreesen* (in Zeller Herb. 1849, and Dodge Herb. 356).

California: Placer County, Wire Bridge, *C. L. Phillips* (H. W. Harkness, 234, cotype, in Dudley Herb. at Leland Stanford Jr. Univ.).

6. **Hysterangium affine** Massee & Rodway, Kew Bull. Misc. Inf. **1898**: 127. 1898; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 246. 1902; Rodway, Roy Soc. Tasmania Papers & Proc. **1911**: 27. 1912; **1923**: 154–155. 1924. Pl. 2, fig. 1; pl. 3, fig. 6.

Type: in Kew Herb. and in Rodway Herb. but not seen.

Fructifications 1–2 cm. in diameter, white at first, drying pinkish buff to avellaneous; mycelium white, terete, branched; fibrils scarce, black, innate, small, only on the under side of the fructification; columella dendroid; peridium easily separable, 120–240 μ thick, composed of parenchyma of large, thin-walled cells, the outer layer of sterile glebal tissue 200–220 μ thick, composed of thick-walled, hyaline, highly gelatinized hyphae 3–4 μ in diameter, often so regular as to make the peridium appear duplex; gleba "toughly gelatinous, dark greenish slate" (Rodway), the freshly cut gleba deep slate-olive to dull greenish black (1), but the fractured surface, after drying, is gnaphalium-green to sage-green, very hard; cavities irregular, small, filled with spores; septa 70–150 μ thick, composed of highly gelatinized hyphae 5–7 μ in diameter; basidia clavate, 4–6-spored, 16–18 × 6 μ; sterigmata short; spores hyaline, ellipsoidal, 8–15 × 3–5.5 μ (average 9.7 ± 0.4 μ).

Under *Quercus* and *Eucalyptus*. Oregon and Tasmania. June to October.

Specimens examined:

Oregon: Linn County, *S. M. Zeller, 2585* (in Oregon Agr. Coll. Herb. 4855, and Zeller Herb.).

California: Alameda County, Shepard Canon, near Oakland, *H. E. Parks, 1168, 1169* and *C. W. Dodge* (in Univ. Cal. Herb., Zeller Herb., and Dodge Herb. 1582, 1580).

Tasmania: Hobart, Cascades, *L. Rodway, 1122*, and unnumbered specimen (in Lloyd Mus. 1122 and 086); Proctor's Road, *L. Rodway, 1261* (in Dodge Herb. 308, and Zeller Herb. 7064).

Australia: South Australia, Mt. Lofty, *J. B. Cleland, 8* (in Cleland Herb., Dodge Herb. 2848, and Zeller Herb.).

6a. Var. **irregulare** Massee, Kew Bull. Misc. Inf. **1901:** 158. 1901; Rodway, Roy. Soc. Tasmania Papers & Proc. **1911:** 27. 1912.

Hysterangium Eucalyptorum Lloyd, Myc. Notes **65:** 1031. 1921; **66:** 1119–1120. 1922.

Illustrations: Lloyd, Myc. Notes **66:** *f. 2132.*

Type: probably in Kew Herb. and Rodway Herb. but not seen.

This variety was distinguished by its irregular outlines, by its thinner peridium, darker gleba, and smaller spores, but the extreme variations in size of the spores of a single fructification are greater than those given for this variety.

On roots of *Eucalyptus.* Ecuador and Tasmania.

Specimens examined:

Ecuador: Quito, *L. Mille, 3,* type of *H. Eucalyptorum* (in Lloyd Mus.).

6b. Var. **tenuispora** Rodway, Roy. Soc. Tasmania Papers & Proc. **1911:** 27. 1912.

Type: probably in Rodway Herb. but not seen.

This variety was distinguished from the type by the thinner peridium, nearly black gleba, and slender spores 12–14 × 2.5–3 μ in length, being more than four times the width instead of less than three times as in the species.

7. Hysterangium clathroides Vittadini, Monogr. Tuberac. 13–14. 1831; Corda, Anleit. z. Stud. Myc. 110. 1842; Icones Fung. **5:** 26. 1842; Tulasne, Fung. Hypog. 80–82. 1851; DeToni in Sacc. Syll. Fung. **7:** 155–156. 1888; Hesse, Fung. Hypog. **1:** 98–100. 1891; Harkness, Cal. Acad. Sci. Proc. III. **1:** 256. 1899; Bucholtz, Материалы къ морфологіи и систематикѣ подземныхъ грибовъ . . . Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ С. Михайловскомъ Московской губ. **1:** 152–153. 1902 [often cited as Beitr. Morph. Syst. Hypog.]; Th. M. Fries, Svensk Bot. Tidskr. **3:** 280. 1909; Rodway, Roy.

Soc. Tasmania Papers & Proc. **1911**: 27. 1912; 1923; 155–156. 1924; Th. C. E. Fries, Arkiv f. Bot. **17**[9]: 18. 1921.
Pl. 2, fig. 3; pl. 3, fig. 12.

Splanchnomyces clathroides Corda (ed. Zobel), Icones Fung. **6**: 41. 1854.

Hysterangium stoloniferum var. *americanum* Fitzpatrick, Ann. Myc. **11**: 129–135. 1913.

Rhizopogon virens Fries, Syst. Myc. **2**: 294. 1823 (excl. syn. sec. spec. in Herb. Fries, fide Th. M. Fries, Svensk Bot. Tidskr. **3**: 280. 1909); Karsten, Finska Vet.-Soc. Bidrag Natur och Folk **25**: 354–355. 1876 [Myc. Fenn. **3**: 354–355. 1876]; *Ibid.* **48**: 18–19. 1889 [Krit. Ofversigt af Finl. Basidsv. 18–19. 1889]. —*Rhizopogon virescens* Karsten in Sacc. Syll. Fung. **9**: 280. 1891 (sec. spec. in Herb. Karsten, fide Th. M. Fries, Svensk Bot. Tidskr. **3**: 280. 1909).

Illustrations: Vittadini, Monogr. Tuberac. *pl. 4, f. 2;* Corda, Anleit. z. Stud. Myc. *pl. D, f. 46^{1-4};* Icones Fung. **6**: *pl. 8, f. 77;* Hesse, Hypog. Deutschl. **1**: *pl. 1, f. 10–14; pl. 7, f. 19;* E. Fischer, in Engl. & Prantl, Die Nat. Pflanzenfam. I. **1**: 305. *f. 154;* Gillet, Champ. Fr. Gast. **3**: *pl. 28;* Bucholtz, *l. c. pl. 1, f. 16;* Fitzpatrick, Ann. Myc. **11**: *f. 2, 6, 10, 20–28.*

Type: location unknown to us.

Fructifications globose, becoming very irregular on drying, white to pale ochraceous buff or light ochraceous salmon when fresh, becoming buff-pink to onion-skin pink where bruised, drying ochraceous tawny to Prout's brown; fibrils variable from terete and free to innate or appressed; columella usually large and prominent, often branching near the base; peridium 220–450 μ thick, parenchymatous, the cells varying from 12 to 40 μ in diameter (see pl. 2, fig. 3); gleba green when fresh, becoming citrine drab or grayish olive to dark greenish olive on drying; cavities polyhedral to irregular, with a tendency to radiate from the columella, small, empty; septa 85–140 μ thick, composed of large, thin-walled, loosely woven hyphae up to 5–7 μ in diameter, finally becoming highly gelatinized; basidia long, irregularly cylindrical, 3–4-spored (mostly 3-spored); sterigmata usually short, although sometimes becoming 16–18 μ long; spores acrogenous, olivaceous in mass, lanceolate, 12–19 × 6–8 μ (averaging

15.3 ± 0.9 μ long), with a thick epispore which sometimes is slightly roughened and becomes loosened in age, sometimes papillate at apex, sometimes not.

Under oaks and other deciduous trees. Cosmopolitan.

This species has a white peridium which turns brown or rusty on exposure to the air. The more or less brittle peridium is easily separable. The gleba is tough and gristly when fresh. The plants are usually found scattered or densely crowded in rocky soil or in soil-filled pockets on rocky ledges. The taste of young plants is pleasant, but the odor of mature ones is so offensive that tasting would be difficult. Hollós, who studied an authentic specimen from Vittadini communicated by Mattirolo, states that the spores are 14–18 × 6–7 μ.

Specimens examined:

Exsiccati: L. Fuckel, Fungi Rhenani Suppl. 2616; Transhel & Serebrianikov, Mycoth. Ross. 216.

Russia: Moscow, Mikhailovskoe, *F. Bucholtz* in Transhel & Serebrianikov, Mycoth. Ross. 216 (in Farlow Herb.).

Czechoslovakia: Cechy, Vloi dul ad Tabor, *F. Bubak* (in von Hoehnel Herb. at Farlow Herb. and in Lloyd Mus. 05861).

Austria: Wiener Wald, *F. von Hoehnel* (in von Hoehnel Herb. at Farlow Herb.); also specimen of *G. Bresadola* det. *H. Thwaitesii* without locality (in Patouillard Herb. at Farlow Herb.).

Germany: Altmorschen, *R. Hesse* (in Farlow Herb.).

Maine: Kittery, Gerrish Island, *R. Thaxter* (in Thaxter Herb.).

Vermont: Rutland County, Pawlet, *C. W. Dodge* (in Dodge Herb.).

New York: Ithaca, Coy Glen, *F. M. Blodgett* (in N. Y. State Coll. Agr. Cornell Univ. Plant Path. Herb. 5342, in Zeller Herb., Lloyd Mus., and Dodge Herb.); *H. H. Whetzel* (in N. Y. State Coll. Agr. Cornell Univ. Plant Path. Herb. 8269, Zeller Herb., and Dodge Herb.); *H. M. Fitzpatrick*, type of *Hysterangium stoloniferum* Tul. var. *americanum* Fitzp. (in N. Y. State Coll. Agr. Cornell Univ. Plant Path. Herb. 8448, Zeller Herb., and Dodge Herb.).

Wyoming: Medicine Bow National Forest, *C. H. Kauffman & B. B. Kanouse* (in Univ. Mich. Crypt. Herb., and in Zeller Herb. 7049).

Oregon: Corvallis, *L. M. Boozer, 35, 36* (in Oregon Agr. Coll. Herb. 4871, 4872, Zeller Herb. 2209, 2801, and Dodge Herb. 320, 321); *S. M. Zeller, 2074, 2582, 7191* (in Zeller Herb., Oregon Agr. Coll. Herb. 4857, 4858, and Dodge Herb.).

California: Placer County, Auburn, *H. W. Harkness, 140* (in Dudley Herb. at Leland Stanford Jr. Univ.); Marin County, Mill Valley, *H. W. Harkness, 119* (in Dudley Herb. at Leland Stanford Jr. Univ.); San Rafael, *H. E. Parks, 2043, 2096, 2111* (in Univ. Cal. Herb. and Zeller Herb.); Santa Clara County, Aldercroft Creek, *H. E. Parks, 60* (in Dodge Herb. 311, and Zeller Herb. 7196), *Z327* (in Zeller Herb. 1662); Saratoga, *H. E. Parks, 452, 971, 978, 992, 995, Z21* (in Univ. Cal. Herb., Zeller Herb. 1664, 7207, 7208, 7210, 7211, 1686, and Dodge Herb. 315, 313, 314, 316, 317); Guadaloupe, *H. E. Parks, 315, 326, 347, 363, 382, 383, 869, Z16* (in Univ. Cal. Herb., Zeller Herb. 1652, 7205, 1718, 7209, 7206, 1674, 7202, 1699, and Dodge Herb. 324, 322, 323, 325, 326, 1508); Alma, *H. E. Parks, 78, 406, 491* (in Univ. Cal. Herb., Zeller Herb. 1657, 7212, 7204, and Dodge Herb. 328, 330); Call of the Wild, *H. E. Parks, 943c* (in Univ. Cal. Herb., Zeller Herb. 7213, and Dodge Herb. 327); Santa Cruz County, Felton, *H. E. Parks, 505* (in Univ. Cal. Herb., Zeller Herb. 7214, and Dodge Herb. 329); Brookdale, *H. E. Parks, 2163* (in Univ. Cal. Herb.).

Chile: Magellanes, Punta Arenas, *R. Thaxter* (in Thaxter Herb.).

7a. Var. **crassum** Tulasne, Fung. Hypog. 81–82. 1851.

Hysterangium clathroides Fuckel, Jahrb. Nassau Ver. f. Naturk. **27**: 11. 1873 [Symb. Myc. Nachtr. **2**: 11. 1873]; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2, I. **1**: 879. 1883; ? Coker & Couch, Gast. E. U. S. & Can., 17–18. 1928, non Vitt.—*Not* Fuckel, Jahrb. Nassau. Ver. f. Naturk. **23**: 38. 1869 [Symb. Myc. 38. 1869].

Type: a portion ex herb. Tulasne in Patouillard Herb. at Farlow Herb.

The variety is distinguished by its larger size, thin, white, smooth peridium, easily separable even in young specimens, covered with a loose, cottony mycelium; gleba glaucous-virescent,

becoming greenish ashy and even clay-color; septa very much thicker than in the type, dark green to almost black. The odor is very pungent, becoming fetid at maturity.

Specimens examined:

Exsiccati: L. Fuckel, Fungi Rhenani Suppl. 2509.

Germany: Altmorschen, *R. Hesse* (in Farlow Herb.).

Switzerland: Chur, *L. Fuckel*, in Fungi Rhenani Suppl. 2509 (in Farlow Herb.).

France: Paris, Parc de Maisons, *L. R. Tulasne*, type (in Patouillard Herb. at Farlow Herb.).

Maine: Kittery, *R. Thaxter, 1902a* (in Thaxter Herb.).

Oregon: Corvallis, *S. M. Zeller, 2581, 7058* (in Oregon Agr. Coll. Herb. 4859, 4864, and Zeller Herb.).

California: *H. E. Parks, 561, 1131* (in Univ. Cal. Herb., Zeller Herb. 7216, and Dodge Herb. 333); Santa Clara County, Guadaloupe, *H. E. Parks, 949, 998* (in Univ. Cal. Herb., Zeller Herb. 7215, 7217, and Dodge Herb. 1502, 2849); Alma, *H. E. Parks, Z28* (in Univ. Cal. Herb., Zeller Herb. 1709, and Dodge Herb. 332); Aldercroft Creek, *H. E. Parks, 38, 1154*, and *Dodge, 1523* (in Zeller Herb. 1658, 2718, and Dodge Herb.); Eva, *H. E. Parks, C. W. Dodge* & *S. M. Zeller* (in Zeller Herb. 2118, and Dodge Herb. 2850).

8. **Hysterangium obtusum** Rodway, n. sp. Pl. 3, figs. 3, 10.

Hysterangium obtusum Rodway, Roy. Soc. Tasmania Papers & Proc. **1919**: 112. 1920; **1923**: 156. 1924 (English description only).

Type: in Rodway Herb., cotype in Dodge Herb. and Zeller Herb.

Fructificationes sphaeroideae, irregulares, 2 cm. diametro metientes, siccatae 1.5 cm. minusve, "pale pink-violet" (Rodway) recens lectae, "light pinkish cinnamon to Sayal brown" (Ridgway) siccatae; mycelium non visum; columella fruticosa; funiculi non visi; peridium crassum 320–375 μ, hyphis tenuibus dense compactum, hyphis exteris brunneo-violaceis; gleba "pale slatey olive" (Ridgway) recens, "dark greenish olive" (Ridgway) siccata; locelli parvi, irregulares, partim sporis impleti; septa 12–30 μ, hyphis tenuibus gelatinosis dense compactis; basidia 17–20 × 5–6 μ, hyalina, cylindrica, sterigmatibus brevibus; sporae ellipsoideae, 7–10 × 4–5 μ, subbrunneae, leves, epispora crassa.

Fructifications spheroidal, irregular, 2 cm. in diameter, drying to 1.5 cm. in diameter or less, pale pink-violet, drying light

pinkish cinnamon to Sayal brown; mycelium not seen; columella branching at the base and penetrating to the center of the fructification as in *Jaczewskia;* fibrils not seen; peridium 320–375 μ thick, composed of spongy pseudoparenchyma, the outer portion of which is tinged brownish violaceous; gleba "pale slatey olive," drying dark greenish olive; cavities small, irregular, partially filled with spores; septa 12–30 μ thick (when distended after drying), composed of slender gelatinous hyphae closely woven; rhaches of the columella same as septa, but 25–50 μ thick; basidia 17–20 × 5–6 μ, hyaline, cylindric; sterigmata short; spores broadly ellipsoidal to obovoidal, 7–10 × 4–5 μ, slightly brownish, smooth with a rather thick epispore.

Specimens examined:

Exsiccati: Torrend, Mycoth. Lusitan. 90, under *Hysterangium clathroides* var.

Portugal: Mafra, *C. Torrend*, in Mycoth. Lusitan. 90 (in Farlow Herb.).

California: Marin County, Mt. Tamalpais, *H. E. Parks, 3049* (in Univ. Cal. Herb.).

Tasmania: Mt. Nelson, *L. Rodway, 1264*, cotype (in Dodge Herb. 354, and Zeller Herb. 7228).

9. Hysterangium inflatum Rodway, sp. nov.

Pl. 2, fig. 4; pl. 3, fig. 19.

Hysterangium inflatum Rodway, Roy. Soc. Tasmania Papers & Proc. **1917**: 108. 1918; **1923**: 156. 1924 (English description only).

Fructificationes subglobosae, circa 1 cm. diametro, quae siccatae indurescunt, cinnamoneo-rufae vel castaneae; peridium 65–160 μ crassitudine, subhyalinum sectum superficie brunnea, parenchymate, separabile; gleba dura siccata, "dark grayish blue-green" vel "greenish slate-black" (Ridgway) septis albidis, gelatinosa recens; locelli subglobosi, 240 μ diametro vel amplius, sporis impleti; septa 45–60 μ crassitudine, hyalina, hyphis magnis hyalinis 5–7 μ diametro metientibus contextis; basidia truncato-clavata, 18–22 × 7–9 μ, sterigmatibus brevibus, 3- vel 7-spora; sporae fusiformes, olivaceo-alutaceae acervatae, hyalinae sub lente, 12–17 × 5–7.5 μ, subappendiculatae, epispora inflata laevi, 14–18 × 10–11 μ metiente, spora longiore sed apice depresso.

Type: in Rodway Herb., cotype in Dodge Herb. and Zeller Herb.

Fructifications subglobose, about 1 cm. in diameter, becoming

very hard when dry, cinnamon-rufous to chestnut-brown; peridium 65–160 μ thick, light brown in section except the darker brown surface composed of parenchyma, separating from the gleba; gleba hard when dry, dark grayish blue-green to greenish slate-black, veined with whitish septa, very gelatinous when fresh; cavities subglobose, 240 μ or larger, filled with spores; septa 45–60 μ thick, hyaline, composed of large longitudinal hyphae 5–7 μ in diameter; basidia truncate-clavate, hyaline, 18–22 × 7–9 μ, with short sterigmata, 3–7-spored; spores fusiform, deep olive-buff in mass to almost hyaline singly under the microscope, 12–17 × 5–7.5 μ, slightly appendiculate, surrounded by a hyaline, smooth, inflated membrane measuring 14–18 × 10–11 μ, somewhat attenuated below, exceeding the spore below but depressed at the apex, exposing the tip of the spore.

California, New Zealand, and Tasmania.

Hysterangium inflatum has closer affinities to the genus *Dendrogaster* than do other species of *Hysterangium.* The inflated exospore is characteristic of *Dendrogaster* but in all other respects *H. inflatum* is like *Hysterangium.*

In young material, part of cotype, the spores are first without the inflated sheath. Some spores show only a shriveling of the outer wall, perhaps the beginning of sheath production.

Specimens examined:

California: Santa Clara County, Aldercroft, *H. E. Parks, 2026* (in Univ. Cal. Herb.).

Tasmania: Mt. Wellington, *L. Rodway, 1267*, cotype (in Dodge Herb. 342, and Zeller Herb. 7223).

New Zealand: Auckland, TeAroha, *G. H. Cunningham, 1189* (in Cunningham Herb.).

10. Hysterangium nephriticum Berkeley, Ann. & Mag. Nat. Hist. **13**: 350. 1844; Outlines Brit. Fungol. 294. 1860; Tulasne, Fung. Hypog. 82. 1851; Cooke, Handb. Brit. Fung. **1**: 358. 1870; De Toni in Sacc. Syll. Fung. **7**: 156. 1888; Hesse, Hypog. Deutschl. **1**: 104–105. 1891. Pl. 3, fig. 16.

Splanchnomyces nephriticum Corda, Icones Fung. **6**: 79. 1854.

Illustrations: Berkeley, Birmingham Nat. Hist. Soc. Rept. &

Trans. **1881**: *pl. 3, f. 10;* Corda, Icones Fung. **6**: *pl. 8, f. 79;* Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 2, 5;* Massee, Ann. Bot. **4**: *pl. 1, f. 4* [Monogr. Brit. Gast. *pl. 1, f. 4*]; Brit. Fung. Fl. **1**: 11. *f. 4;* Smith, Brit. Basid. 490. *f. 143.*

Type: in Berkeley Herb. at Kew; fragment ex herb. Tulasne in Patouillard Herb. at Farlow Herb.

Fructifications 2–2.5 cm. in diameter, drying to less than 1 cm., white at first, drying clay-color or lighter; mycelium white, flat, branched, membranous; columella scarcely more than a sterile base with several branches, as in *Jaczewskia;* fibrils large, prominent and flaky at point of attachment; peridium duplex, 100–240 μ thick, easily separating, especially on drying, as the gleba contracts much more than the peridium, cartridge-buff in cross-section; outer part of first layer cottony, loosely woven, of hyaline, thick-walled hyphae about 6–7 μ in diameter, and inner part of parallel smaller hyphae, and the second layer of pseudoparenchyma about 40 μ thick; gleba at first cartilagineo-glutinous, "pale blue or gray in parts with a green tinge or even pinkish" in very young specimens, drying clay-color and fragile, with columella becoming Kaiser brown on drying; cavities small, nearly filled with spores; septa 85–120 μ thick, composed of loosely interwoven, hyaline hyphae 2–3 μ in diameter, with a tendency to become scissile; basidia cylindric, 2–3 × 17–18 μ long, hyaline, sterigmata short; spores ellipsoidal, 13–18 × 4–6 μ, slightly brownish, more or less stuck together by a gel.

Under *Quercus*. Europe and North America. September to February.

Fructifications of this species are found imbedded in a mass of white mycelial strands which are attached to them at several points. The gleba is first pinkish, then greenish, often drying clay color. The odor is not offensive.

Specimens examined:

England: near Bristol, *C. E. Broome 2/45* (J. W. Bailey Herb. 305, in Brown Univ. Herb.); *C. E. Broome* (in Curtis Herb. at Farlow Herb. and ex-Massee Herb. in N. Y. Bot. Gard. Herb.); near Clifton, *C. E. Broome*, type (in Patouillard Herb. at Farlow Herb.).

Maine: Kittery Point, *R. Thaxter* (in Farlow Herb.).

California: Marin County, Rattlesnake Camp, *H. E. Parks, 2174* (in Univ. Cal. Herb.); Santa Clara County, Guadaloupe, *H. E. Parks, 149, 385* (in Univ. Cal. Herb., Dodge Herb. 351, 352, and Zeller Herb. 7226, 1677).

11. Hysterangium crassirhachis Zeller & Dodge, sp. nov.
Pl. 1, fig. 4; pl. 3, fig. 20.

Fructificationes reniformes, albae dein "sea-shell pink" (Ridgway) vel carneae recens lectae, "pinkish buff" vel "snuff-brown" (Ridgway) siccatae; stipes 1–2 mm. diametro, albus, semper peridio albior siccatus, stuposus, subparallelibus vel anastomosantibus, hyalinis, hyphis 2–2.5 μ diametro compactus, cum capite in medio fructificationis crassissimo (1/3 diametro fructificationis metiente) ex quo radiant lamellae 300–450 μ crassitudine, tenaces, hyphis gelatinosis hyalinis contextis; peridium facile separabile, 400–500 μ crassitudine, pseudoparenchymate, cellulis 8–17 μ diametro strato extero cellulis brunneis 25 μ diametro; gleba gelatinosa recens "grayish olive" vel "deep grayish olive" (Ridgway); locelli simplices vel labyrinthiformes, vacui; septa 85–100, vel etiam 200 μ crassitudine, hyphis gelatinosis hyalinis contexta; basidia di- vel tetraspora, 30–50 × 6–9 μ, hyalinis; sterigmata brevia; sporae fusiformes leves, episporis crassis, uni- vel multiguttulatae breve appendiculatae hyalinae vel olivaceae acervatae, 13–22 × 4–8 μ.

In quercetis et aceretis. Oregon et California. Primo vere.

Type: in Zeller Herb., Dodge Herb., and Oregon Agr. Coll. Herb.

Fructifications spheroidal to depressed, often reniform, 1–2.5 cm. in diameter, white at first, becoming sea-shell pink to flesh-colored when fresh, drying pinkish buff to snuff-brown; stipe in a depression at the base, 1–2 mm. in diameter, white, drying somewhat lighter than the rest of the fructification, stupose, composed of more or less parallel and anastomosing, slender, hyaline hyphae 2–2.5 μ in diameter; columella neutral gray to slate-gray, opalescent when fresh, drying white, flinty, thick, terminating in a broad head at the center of the fructification, covering about one-third of the median vertical section, whence radiate distinct, percurrent branches which are usually at least 300–450 μ thick, tough, composed of highly gelatinized, hyaline, interwoven hyphae; peridium easily separable, 400–500 μ thick, duplex, inner and major portion parenchymatous, composed of hyaline rhomboidal cells, 8–17 μ in diameter, with an outer rind of smaller, thin pseudoparenchyma of brownish cells about 25 μ thick; gleba gelatinous, from grayish olive to deep grayish

olive when fresh; cavities radiating from the columella to the peridium, sometimes simple, appearing as linear openings in sections, but usually labyrinthiform, broken by septa jutting out from the columellar branches on either side, not filled; septa from 85–100 up to 200 μ broad, of interwoven, hyaline hyphae, highly gelatinized; basidia 2–4-spored, 30–50 × 6–9 μ, hyaline; sterigmata short; spores fusiform, smooth, thick-walled, sometimes 1–many-guttulate, hyaline to olivaceous in mass, 13–22 × 4–8 μ, short-appendiculate.

Under *Quercus* and *Acer*. Oregon and California. May.

These plants are characterized by the brittle peridium, which is easily separable when fresh, and by the tough, rubbery gleba with its large translucent septa which become flinty when dry.

Specimens examined:

Oregon: Benton County, Corvallis, *L. M. Boozer*, type (in Zeller Herb. 2319, Dodge Herb. 334, and Oregon Agr. Coll. Herb. 4862); *L. M. Boozer* (in Zeller Herb. 2320); Sulphur Springs, *Helen M. Gilkey* (in Oregon Agr. Coll. Herb. 4861, 4860, and Zeller Herb. 2343, 2348).

California: Marin County, San Rafael, *H. E. Parks, 3037* (in Univ. Cal. Herb.); Santa Clara County, Alma, *H. E. Parks, 156* (in Dodge Herb. 338, Zeller Herb. 7219, and Univ. Cal. Herb.); Mt. Umunhum, *H. E. Parks, 897* (in Univ. Cal. Herb., Dodge Herb. 340, and Zeller Herb. 7220); Saratoga, *H. E. Parks, 815, 2160* (in Dodge Herb. 339, 2851, and in Univ. Cal. Herb.).

12. Hysterangium Harknessii Zeller & Dodge, sp. nov.
Pl. 3, fig. 24.

Hysterangium australe Harkness, Cal. Acad. Sci. Proc. III. **1**: 256. 1899, *not H. australe* Spegazzini, Soc. Cientif. Arg. Anal. **11**: 242–243. 1881 [often cited as Fung. Arg. **4**: 94. 1881].

Type: in Dudley Herb. at Leland Stanford Jr. Univ.

Fructificationes ellipsoideae, 1 × 1 × 1.5 cm. metientes, argillaceae vel fulvae; columella tenuior; peridium tenue, 90–135 μ crassitudine, intus tenuibus hyphis 3–4 μ diametro minusve, hyphis exteris superficiei fructificationis perpendicularibus; gleba viridis, locellis luteis, subimpletis; septa 120–300 μ crassitudine, hyphis magnis laxe implexis, gelatinosis; basidia non visa; sporae 13–18 × 5–6 μ, fusiformes, subappendiculatae, luteae.

In quercetis. California.

Type: in Dudley Herb. at Leland Stanford Jr. Univ.

Fructifications ellipsoidal, 1 × 1 × 1.5 cm., clay-color to tawny; columella branching, slender; peridium thin, 90–135 μ thick, composed of thick-walled hyphae 3–4 μ in diameter, duplex, the inner portion compact, pseudoparenchymatous, cells mostly periclinal, 40–50 μ, the outer 50–85 μ, composed of loosely interwoven radial hyphae; gleba dark green, with yellowish cavities, nearly filled; septa 120–300 μ thick, composed of large, thin-walled, loosely interwoven, gelatinizing hyphae; basidia not seen; spores 13–18 × 4–6 μ, fusiform, slightly appendiculate, yellowish.

Under *Quercus*. California. April.

Harkness referred four specimens to *Hysterangium australe* Spegazzini, of which Nos. 119 and 140 are *H. clathroides*, No. 155 is *Hysterangium* sp., and No. 84, the only specimen mentioned by number by Harkness (*l. c.*), is taken as the *type* of *H. Harknessii*. The outer layer of the peridium is almost identical with that of *H. strobilus*, but the inner layer is pseudoparenchymatous while in *H. strobilus* it is parenchymatous. These two species also differ in dimensions of sterile tissues and in color and texture of the gleba.

Specimens examined:

California: Marin County, Mt. Tamalpais, *H. W. Harkness, 84*, type (in Dudley Herb. at Leland Stanford Jr. Univ.).

13. Hysterangium cinereum Harkness, Cal. Acad. Sci. Proc. III. **1**: 254. 1899; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 245. 1902.

Illustrations: Harkness, Cal. Acad. Sci. Proc. III. **1**: *pl. 42, f. 2.*

Type: cotype in Dudley Herb. at Leland Stanford Jr. Univ.

Fructifications depressed-globose, 1 × 2 cm., cinnamon to bister in alcohol; fibrils scanty, small, concolorous, base not prominent; columella large at base, branching; peridium duplex, 300 μ thick, outer layer of dark brown hyphae 4–5 μ in diameter, inner layer of gelatinized hyphae 3–8 μ in diameter, compact; gleba firm, dark olive-buff to citrine-drab; cavities empty; septa 80–90 μ thick, of compact, gelatinized hyphae; basidia cylindric, 10–14 × 4–5 μ; sterigmata 11–12 μ long; spores greenish yellow, rhomboid-ellipsoidal to allantoid, 12–16 × 4–7 μ.

Under *Arctostaphylos* and *Quercus*. California. February to June.

Specimens examined:

California: Placer County, Auburn, *H. W. Harkness, 31*, cotype (in Dudley Herb. at Leland Stanford Jr. Univ.); Marin County, Mt. Tamalpais, *H. E. Parks, 3050* (in Univ. Cal. Herb.); San Rafael, *H. E. Parks, 2043* (in Univ. Cal. Herb.); San Mateo County, Redwood Park, *H. E. Parks, 2190* (in Univ. Cal. Herb.); Santa Clara County, Aldercroft Creek; *H. E. Parks, 1153*, and *C. W. Dodge* (in Dodge Herb. 1522); Saratoga, *H. E. Parks, 1155*, and *C. W. Dodge* (in Dodge Herb. 1524).

14. Hysterangium membranaceum Vittadini, Monogr. Tuberac. 14. 1831; Tulasne, Fung. Hypog. 83. 1851; Winter in Rabenhorst, Krypt. Fl. Deutschl. ed. 2, I. **1**: 879. 1883; DeToni in Sacc. Syll. Fung. **7**: 156. 1888; Rodway, Roy. Soc. Tasmania Papers & Proc. **1911**: 26. 1912; **1923**: 157. 1924. Pl. 3, fig. 17.

Splanchnomyces membranaceus Corda, Icones Fung. **6**: 41. 1854.

Illustrations: Vittadini, Monogr. Tuberac. *pl. 4, f. 15;* Corda, Icones Fung. **6**: *pl. 8, f. 78;* Patouillard, Tab. Anal. *f. 364*.

Type: location unknown to us.

Fructifications nearly spherical, 0.8–1 cm. in diameter, cream-color when fresh, drying tilleul-buff to wood-brown; columella short and inconspicuous, not extending more than half way to the center of the fructification; peridium thin, membranous, papery, separable, 25–55 μ thick, composed of parallel, thin-walled, brownish hyphae; gleba court-gray when fresh, becoming warm buff when dry; cavities minute and irregular; septa very thin, 10–15 μ, sometimes scissile; basidia narrow-cylindrical, 2–3-spored; spores almost hyaline, about 7.5–11 × 5–6 μ, ovate to ellipsoidal.

Under *Acer*. Cosmopolitan. July in Tasmania, October in Oregon.

Specimens are tiny and quite ill-scented, like musty wine.

Specimens examined:

Oregon: Linn County, *S. M. Zeller, 2584* (in Oregon Agr. Coll. Herb. 4865, and Zeller Herb.).

Tasmania: Hobart, *L. Rodway* (in Lloyd Mus. 083); Cascades, *L. Rodway, 1270* (in Dodge Herb. 345, and Zeller Herb. 7224); Waterworks, *L. Rodway, 1120* (in Lloyd Mus.).

15. Hysterangium fuscum Harkness, Cal. Acad. Sci. Proc. III. **1**: 257. 1899; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 247. 1902. Pl. 3, figs. 4, 14.

Hysterangium Gardneri E. Fischer in Fedde, Rep. Nov. Sp. **7**: 194. 1909; Saccardo & Trotter in Sacc. Syll. Fung. **21**: 495. 1912.—*H. Gardneri* E. Fischer, Ber. d. deut. bot. Ges. **25**: 276. 1907 (nom. nud.); Bot. Zeit. **66**: 164–166. 1908.

Illustrations: E. Fischer, Bot. Zeit. **66**: *pl. 6, f. 19.*

Type: cotype in Dudley Herb. at Leland Stanford Jr. Univ.

Fructification spherical, 1–2 cm. in diameter, buckthorn-brown to mummy-brown and clover-brown in alcohol; fibrils scarce, not prominent although becoming nearly free below, innate-appressed above, concolorous, hence inconspicuous; columella percurrent or nearly so, slender, not conspicuously branched; peridium 200–235 μ thick, of coarse, thick-walled, closely interwoven, dark brown hyphae; gleba isabella color to olive-brown; septa 45–75 μ thick, of fine gelatinized hyphae; basidia ellipsoidal with short sterigmata; spores yellow-brown, fusiform, 10–12 × 4–5 μ.

Under *Eucalyptus*. California. March.

Specimens examined:

California: Marin County, Mill Valley, *H. W. Harkness, 177*, cotype (in Dudley Herb. at Leland Stanford Jr. Univ.); Alameda Co., Shepard Canon near Oakland, *H. E. Parks, 1167, 1172*, and *C. W. Dodge, 1586, 1589* (in Univ. Cal. Herb., Dodge Herb., and Zeller Herb. 7189); Berkeley, *N. L. Gardner*, type of *H. Gardneri* (in Univ. Cal. Herb. 214).

16. Hysterangium rubricatum Hesse, Jahrb. f. wiss. Bot. **15**: 631. 1884; Hypog. Deutschl. **1**: 95–97. 1891; DeToni in Sacc. Syll. Fung. **7**: 491. 1888. Pl. 3, fig. 27.

Illustrations: Hesse, Jahrb. f. wiss. Bot. **15**: *pl. 32;* Hypog. Deutschl. **1**: *pl. 1, f. 1–5; pl. 5, f. 13, 14; pl. 6, f. 1, 9, 10.*

Type: not seen, but authentic material from Hesse in Farlow Herb.

Fructifications variable in size, 1–4 cm. in diameter, spherical to reniform; columella usually drying to slender, branched, dendroid veins, from a slight thickening at the base; peridium 150–400 μ thick, at first white, drying light ochraceous buff to russet, the outer portion very compact, with abundant crystals of calcium oxalate, the inner layers composed of more loosely woven hyphae, with clamp-connections and studded with oxalate crystals; gleba pale purplish to light pink when fresh (Parks), drying fragile, usually pinkish buff to Sayal brown; cavities labyrinthiform, small; septa hyaline, 25–100 μ thick, composed of compact, parallel hyphae; basidia mostly 2-spored, hyaline, 16–18 × 6–7 μ; sterigmata short; spores broadly fusiform, granular, hyaline to light buff in mass, appendiculate, smooth, 12–17 × 5–8 μ.

Under *Quercus*, *Arbutus*, and *Fagus*. Pacific Coast of North America and Germany. Spring.

Large groups of fruiting bodies are often found on one mycelium. They are first white, becoming reddish brown on exposure to the air.

Specimens examined:

Germany: *R. Hesse* (in Farlow Herb., also ex Mattirolo, 19, in Lloyd Mus.).

Oregon: Corvallis, *S. M. Zeller, 7193* (in Oregon Agr. Coll. Herb. 4870, and Zeller Herb.).

California: Marin County, San Rafael, *H. E. Parks, 2109, 2123* (in Univ. Cal. Herb.); Santa Clara County, Alma, *H. E. Parks, 157, 468* (in Univ. Cal. Herb., in Dodge Herb. 363, 364, and in Zeller Herb. 1680, 7230), and Guadaloupe Mines, *H. E. Parks, 141, 386, 413, 861, 959* (in Univ. Cal. Herb., in Dodge Herb. 360, 361, 359, 1500, 358, and in Zeller Herb. 1676, 1693, 7195, and 7194); Saratoga, *H. E. Parks, Z20, Z23, 451* (in Zeller Herb. 1684, 1687, 7231).

17. Hysterangium Pompholyx Tulasne, Ann. Sci. Nat. Bot. II. **19**: 375. 1843; Fung. Hypog. 83–84. 1851; DeToni in Sacc. Syll. Fung. **7**: 157. 1888; ? Coker & Couch, Gast. E. U. S. & Can., 19–20. 1928. Pl. 3, fig. 23.

Illustrations: Tulasne, Ann. Sci. Nat. Bot. II. **19**: *pl. 17, f. 17–19;* Fung. Hypog. *pl. 2, f. 3; pl. 11, f. 6.*

Type: fragment from Tulasne Herb. in Patouillard Herb. at Farlow Herb.

Fructification at first white, becoming reddish and then dark brown, 1–1.5 cm. in diameter, globose to depressed-globose, surface with flakes of white mycelium or flocculent with more or less fascicled hyphae; columella extending three-fourths the length of the fructification, branched; peridium 300–600 μ thick, composed of septate hyphae more or less braided together, variable in size, with enlarged, irregular cells, darker brown toward the surface, hyaline within, the open canals in the peridium being about 20–22 μ in diameter; gleba at first white, then dull reddish brown, drying buffy olive to light brownish olive, compact; cavities radially arranged; septa 90–120 μ thick, composed of parallel, compact, hyaline hyphae; basidia large, cylindric, 35–40 × 7–8 μ; spores dilute olivaceous in mass, 12–14 × 5–6 μ, short elliptic-fusiform, apices usually rounded, sometimes with a slightly roughened exospore.

Under *Carpinus* and *Fagus*. France and eastern North America.

Specimens examined:

France: Aisne, Foret de Marly, *N. Patouillard* (in Patouillard Herb. at Farlow Herb.); Seine et Oise [? Meudon], *L. R. Tulasne*, type (fragment in Patouillard Herb. at Farlow Herb.).

Maine: Kittery Point, *R. Thaxter*, "6 Je '86" (in Thaxter Herb.).

Tennessee: Burbank, *R. Thaxter* (in Thaxter Herb. B3H).

18. Hysterangium cistophilum (Tulasne) Zeller & Dodge, sp. nov.
Pl. 2, fig. 2; pl. 3, fig. 22.

Hysterangium clathroides Tulasne in Durieu de Maison-Neuve, Expl. Sci. de l'Algérie, Bot. **1**: 395. 1846–1849.—*H. clathroides* Vittadini var. *cistophilum* Tulasne, Fung. Hypog. 81. 1851; Bataille, Soc. Myc. France Bull. **39**: 168. 1923.

Illustrations: Durieu de Maison-Neuve, Expl. Sci. de l'Algérie, Bot. **1**: *pl. 24, f. 7–11.*

Type: R. Maire, Mycoth. Bor.-Afric. **13**: 311.

Fructifications spherical to reniform, 1–2.5 cm. in diameter, at first white, becoming red-brown on exposure, drying pinkish buff to tawny olive, growing from ramose, white rhizomorphs;

columella not well developed but, when apparent, dendroid with thin branches; peridium tough, 70–170 μ thick, scarcely separable in young specimens to easily separable at maturity, loosely to closely stupose, composed of brownish hyphae, mostly parallel to the surface; gleba dark green (Parks) or deep olive (Tulasne and Thaxter) when fresh, becoming buffy citrine to olive-citrine when dry; cavities small but long and narrow, mostly arranged radially with reference to their longest diameter, empty; septa 50–120 μ thick, hyaline, composed of compact, parallel hyphae, somewhat gelatinized; basidia obovate to clavate, 2–4-spored, 10–18 × 5–6 μ, sterigmata short; spores almost sessile, fusiform, yellowish to dilute olivaceous under the microscope, slightly appendaged, smooth, 10–17 × 6–7.5 μ (average 13.1 ± 0.7 × 6.5 μ). Odor similar to that of ether (Tulasne).

Gregarious or singly under a thin layer of leaves. Under *Quercus, Arbutus, Eucalyptus,* and *Pistacia.* Cosmopolitan.

A fragment ex herb. Tulasne, without locality, in the Patouillard Herb. at the Farlow Herb. agrees with the above in all respects.

Specimens examined:

Exsiccati: R. Maire, Mycoth. Bor.-Afric. **13:** 311, under the name *Hysterangium clathroides* Vitt. var. *cistophilum* Tul.; Migula, Cryptog. Germ. Austr. et Helv. Exsicc. 191, under the name *Hysterangium clathroides* Vitt.

Austria: Wiener Wald, *F. von Hoehnel* (in von Hoehnel Herb. at Farlow Herb.).

Czechoslovakia: Cechy, *F. Bubak,* in Migula, Cryptog. Germ. Austr. et Helv. Exsicc. 191, under the name *Hysterangium clathroides* Vitt. (in Farlow Herb. at Harvard Univ.).

Germany: Eisenkaute, *R. Hesse* (Herb. Bot. Inst. Univ. Marburg).

Algeria: Baali prés Souma, *A. Duvernoy & R. Maire,* type, in R. Maire, Mycoth. Bor.-Afric. **13:** 311, under the name *Hysterangium clathroides* Vitt. var. *cistophilum* Tul. (in Farlow Herb. at Harvard Univ.).

Oregon: Benton County, Corvallis, *S. M. Zeller, 7197* (in Oregon Agr. Coll. Herb. 4856, and Zeller Herb.).

California: Santa Clara County, Saratoga, *H. E. Parks, 292,*

980 (in Dodge Herb. 2127, 2128, and in Zeller Herb. 7198); Guadaloupe, *H. E. Parks, 148* (in Dodge Herb. 2130, and Zeller Herb. 7201).

Chile: Punta Arenas, *R. Thaxter*, two collections (in Thaxter Herb.).

19. Hysterangium Fischeri Zeller & Dodge, sp. nov.

Pl. 1, fig. 2; pl. 3, fig. 8.

Hysterangium sp. (near *H. siculum*) E. Fischer, Ber. d. deut. bot. Ges. **25**: 375–376. 1907.—*Hysterangium* Nr. 258, E. Fischer, Bot. Zeit. **66**: 163–164. 1908.

Type: in Univ. Cal. Herb.

Fructificationes irregulares, depresso-globosae, 2–3.5 × 1–2 cm. metientes, "Natal brown" servatae, "avellaneous" vel "wood-brown" siccatae; columella basi ramosa, tenuis; peridium 90–200 μ crassitudine, stuposum, hyphis magnis, granulosis, flavo-brunneis, 5–8 μ diametro, extus laxe implexis, intus tenuioribus compacte contextis; gleba "buffy citrine" vel "olive citrine"; locelli parvi, irregulares, sporis impleti; septa 35–80 μ crassitudine, hyphis tenuibus, 3–5 μ diametro contexta, gelatinosa; basidia 2-5-spora, 10–12.6 × 2.5–5.5 μ; sporae "old gold," ellipsoideae, basi truncatae, laeves, 8–11 × 4–5.5 μ.

Fructifications irregularly depressed-globose, 2–3.5 × 1–2 cm., Natal brown, drying avellaneous to wood-brown; columella branching almost at the base of the fructification, slender, inconspicuous; peridium 90–200 μ thick, stupose, composed of granulose, large, thin-walled, yellow-brown hyphae 5–8 μ in diameter, loosely woven toward the outside, slightly smaller and more compactly woven within; gleba buffy citrine to olive-citrine; cavities very small, irregular, filled with spores; septa 35–80 μ thick, composed of slender, thin-walled hyphae 3–5 μ in diameter, becoming highly gelatinized at maturity; basidia obscure, 2–5-spored, 10–12.6 × 2.5–5.5 μ; spores acrogenous, old-gold, ellipsoidal, often truncate at the base, smooth, 8–11 × 4–5.5 μ. No odor.

Under *Quercus* and *Eucalyptus*. Oregon, California, and Australia. February to May.

Specimens examined:

Oregon: Corvallis, *S. M. Zeller, 7056* (in Oregon Agr. Coll. Herb. 4863, and Zeller Herb.).

California: Alameda County, Berkeley, *W. A. Setchell & C. C. Dobie*, type (in Univ. Cal. Herb. 258); Oakland, *C. W. Dodge &*

H. E. Parks, 1166 (in Dodge Herb. 1579, and Zeller Herb. 7221); San Mateo County, Redwood Park, *H. E. Parks & Martha Watson, 13* (in Univ. Cal. Herb. 2229); Santa Clara County, Alma, *H. E. Parks, 997* (in Univ. Cal. Herb.).

Australia: Victoria, *F. Martin, 467* (in Kew Herb.).

EXTRA-LIMITAL SPECIES

1. Hysterangium purpureum Zeller & Dodge, sp. nov.

Pl. 1, fig. 5; pl. 3, fig. 21.

Fructificationes ad 2 cm. metientes, laete lavendulicoloris, purpurascentes tactu, siccatae "grayish olive" vel "citrine drab" (Ridgway), "dull purplish black" (Ridgway) servatae; funiculi nulli; stipes ad 4 mm. longitudine, unde multae rhizomorphae nascuntur; columella arborea, in medio fructificationis percurrens; peridium 520–950 μ crassitudine, cellulis pseudoparenchymatibus ad 16–17 μ diametro metientibus, minoribus extus; gleba purpureo-brunnea, vel nigro-brunnea (teste Thaxtero), "benzo brown to hair-brown" (Ridgway) siccata; septa variabilia, 25–95 μ crassitudine, gelatinosa, hyphis tenuibus, 1 μ diametro contexta hyphis majoribus in septis crassioribus; basidia tetraspora, 25–30 × 5–7 μ, cylindrica, sterigmatibus brevibus; sporae sessilles, 13–16 × 5–6 μ, elongato-ellipsoideae vel ovatae, obtusae.

Type: in Thaxter Herb.

Fructifications up to 2 cm. in diameter, bright, deep lavender, becoming purplish red on handling and dull purplish red when fully matured, drying grayish olive to citrine drab, becoming dull purplish black in alcohol, coloring alcohol and paper purple; fibrils absent; stipe continuous with the columella, up to 4 mm. long, terminating in many branching rhizomorphs; columella dendroid, reaching beyond the center of the fructification; peridium 520–950 μ thick, duplex, outer layer purplish brown, 90–120 μ thick, parenchymatous, composed of smaller cells on the outside, becoming larger within, inner layer 640–830 μ thick, rather falsely pseudoparenchymatous, hyaline or with vinaceous tints, pierced tangentially by large hyphae which are often vesicular and up to 16–17 μ in diameter; gleba purplish brown to blackish brown in fully matured specimens (Thaxter field notes), drying benzo brown to hair-brown after removing from alcohol; septa more hyaline in section than inner peridium, variable in thickness from 25 to 95 μ, gelatinized, composed of small hyaline hyphae 1 μ in diameter; basidia 4-spored, 25–30 × 5–7 μ, cylindrical; spores sessile, 13–16 × 5–6 μ, long-ellipsoidal or tapering toward the basidium, obtuse, vinaceous *in mass*.

This is a beautiful purple species having a duplex peridium of two types of parenchyma, the inner of which has rather large, irregular, intercellular cavities. It approaches *H. Phillipsii* in its radicate base. *H. purpureum* is strikingly distinct from all other species in color and peridial characters.

Specimens examined:

Chile: Magellanes, Punta Arenas, *R. Thaxter*, *Hypog. 12*, type (in Thaxter Herb. and fragment in Zeller Herb. 7232).

2. **Hysterangium stoloniferum** Tulasne, Ann. Sci. Nat. Bot. II. **19**: 376. 1843; Fung. Hypog. 84–85. 1851; Winter in Rabenhorst, Krypt. Fl. Deutschl. ed. 2, I. **1**: 879. 1883; DeToni in Sacc. Syll. Fung. **7**: 157. 1888; Hesse, Hypog. Deutschl. **1**: 100–101. 1891; Th. M. Fries, Svensk Bot. Tidskr. **3**: 281. 1909; Th. C. E. Fries, Arkiv f. Bot. **17**^{9}: 19. 1921. Pl. 3, fig. 13.

Illustrations: Tulasne, Fung. Hypog. *pl. 11, f. 8;* Fourquignon, Champ. Super. 125; Hesse, Hypog. Deutschl. **1**: *pl. 1, f. 6–9.*

Type: portion in Patouillard Herb. at Farlow Herb.

Fructifications spherical, "the size of a filbert," smooth, white, drying to 4 mm., Isabella color; stipe prolonged into a long cylindrical, solid, white radicle, sparsely branched; columella nearly percurrent, drying 300–400 μ thick; peridium membranaceous, at length subcoriaceous, easily separable, drying 400 μ thick, composed of parenchyma with cells 5–6 μ in diameter; gleba bluish in young material, becoming grayish fuscous and drying cinnamon-buff; cavities elongate, radiating from the whole length of the columella, filled with spores; basidia slender, cylindrical, mostly 2-spored, sterigmata short; spores ellipsoidal, smooth, light yellow under the microscope, dirty brown in mass, 16.6–23.2 × 6–7 μ, mean length 19.7 ± 0.95 μ, appendiculate.

Under decaying oak leaves. Central Europe. Autumn.

The above reference of Hesse is doubtful since he reports the peridium as composed of slender parallel hyphae, larger in diameter toward the outside and tapering towards the gleba.

Specimens examined:

Exsiccati: L. Fuckel, Fung. Rhenani Suppl. 2616.

Hungary: Prencsfalu near Jalsava, *A. Kmet* (in Lloyd Mus. 1921).

Germany: Hessen Nassau, Eisenkaute, *R. Hesse VII, 91* (in Herb. Bot. Inst. Univ. Marburg, as *H. coriaceum*); Rabenkopf bei Oestrich, *L. Fuckel*, Fung. Rhenani Suppl. 2616 (copy in Farlow Herb.).

France: Poitou, near Bonnes, *L. R. Tulasne*, type (portion in Patouillard Herb. at Farlow Herb.).

2a. Var. **rubescens** (Quelet) Zeller and Dodge, n. comb.

Hysterangium clathroides Vittadini var. *rubescens* Quelet, Enchiridion Fung. 246. 1886.—*H. rubescens* Patouillard, Soc. Myc. France Bull. **30**: 351–352. 1914; *not* Tulasne, Ann. Sci. Nat. Bot. **19**: 375. 1843.

H. clathroides Quelet, Soc. d'Emul. Montbéliard, Mem. II. **4**: 375. 1873 [Champ. Jura Vosges **2**: 375. 1873]; *not* Vittadini, Monogr. Tuberac. 13–14. 1831.

H. clathroides Vittadini var. *mutabile* Bucholtz, Soc. Imp. Nat. Moscou Bull. **1907**: 467. 1908; Saccardo & Trotter in Sacc. Syll. Fung. **21**: 495. 1912.

Illustrations: Quelet, Soc. d'Emul. Montbéliard Mem. II. **4**: *pl. 4, f. 5* [Champ. Jura Vosges **2**: *pl. 4, f. 5*].

Type: location unknown to us, type of *H. rubescens* Patouillard in Patouillard Herb. at Farlow Herb.

The variety differs from the species in its becoming grayish red on exposure or to the touch, its gleba being buffy olive instead of cinnamon-buff; spores 21–23 × 6–7 μ.

Under *Quercus* and *Tilia*. France and Russia.

Quelet figures his plant as stoloniferous and small, although he refers it to *H. clathroides*. The material in the Patouillard Herbarium was first determined as *H. clathroides*, then *H. stoloniferum*, before it was published in its present position. (We have been unable to find microscopic characters to separate it from the species.) Variety *mutabile* Bucholtz appears to be the same, although we have not seen the type. It was described with slightly larger spores, 21–23 × 6–7 μ.

Specimens examined:

France: [Jura, between Lons le Saunier and Leponay], *N. Patouillard* (three collections in Patouillard Herb. at Farlow Herb.).

3. **Hysterangium neocaledonicum** Patouillard, Soc. Myc. France Bull. **31**: 34. 1915; Trotter in Sacc. Syll. Fung. **23**: 598. 1925. Pl. 3, fig. 29.

Type: in Patouillard Herb. at Farlow Herb., Harvard Univ.

Fructifications fleshy, oblong-spherical, 2–3 cm. in diameter, rose-color, becoming brownish in alcohol, each borne on a tough and hard rhizomorph; surface of the fructification costate, marked with furrows rising at the base and extending to the top; peridium membranaceous, easily separable, 120–320 μ thick, pseudoparenchymatous, composed of ovoid cells about 20 μ in diameter; gleba subgelatinous, elastic, ochraceous; columella dendroid, branched; septa radiating from the base, 75–120 μ broad; cavities minute, irregular, filled with spores at maturity; basidia short, 4-, rarely 2-, spored; spores subsessile, ellipsoid-elongate, smooth, almost mucronate at the apex or obtusely rounded, subhyaline, appendiculate, 14–16 × 4–5 μ.

Specimens examined:

Loyalty Islands: New Caledonia, *M. Le Rat*, type (in Patouillard Herb. at Farlow Herb.).

4. **Hysterangium coriaceum** Hesse, Hypog. Deutschl. **1**: 101. 1891; Saccardo, Syll. Fung. **11**: 168. 1895.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 24; pl. 9, f. 5.*

Type: in Herb. Bot. Inst. Univ. Marburg.

Fructifications globose, 1–1.5 cm. in diameter, smooth and white, becoming flesh-red on handling or in light, Verona brown to snuff-brown in alcohol; columella highly developed in the central part of the gleba, light brown; peridium 300–500 μ thick, leathery, easily separable from the gleba, with a very thin outer layer of light brown, closely grouped hyphae; next within, a layer of pseudoparenchyma, thick and violet-colored under the microscope, with another layer of thin-celled, almost colorless hyphae next to the gleba; gleba gray to olive-green, light brownish olive in alcohol, cavities frequently circular in section; septa 130–150 μ thick, composed of hyaline gelatinized hyphae; basidia narrow-cylindrical, mostly 2-spored; sterigmata short; spores 8–12 × 3–4 μ, slightly appendiculate, slightly brownish in mass with a thick epispore.

Under *Betula, Corylus,* and *Fagus silvatica.* Germany. Autumn.

Fructifications turn cherry-red when first placed in alcohol, but the alcohol becomes completely decolorized in a few weeks, and the specimens brownish. Perhaps this species should be regarded as a variety of *H. clathroides,* from which it differs in having a slightly thicker peridium, more brownish gleba, and smaller spores.

Specimens examined:

Germany: Eisenkaute, *R. Hesse* (in Herb. Bot. Inst. Univ. Marburg).

5. Hysterangium siculum Mattirolo, Malpighia **14:** 86. 1900; Saccardo & P. Sydow in Sacc. Syll. Fung. **16:** 246–247. 1902; E. Fischer, Ber. d. deut. bot. Ges. **25:** 375. 1907.

Illustrations: Mattirolo, Malpighia **14:** *pl. 1, f. 8–10.*

Type: location unknown to us.

Fructifications globose or depressed-globose, gregarious, white at first, becoming reddish and finally brownish on exposure, coloring alcohol brown; peridium thick, firm, duplex, the outer layer 90–120 μ thick, pseudoparenchymatous, inner layer fibrous, of the same texture as the gleba; gleba bright olivaceous to glauco-virescent; cavities narrow, unequal, mostly linear-elongate, basidia 2–4-spored; sterigmata short; spores ellipsoid, hyaline, smooth, virescent in mass, 18 × 6 μ.

Sicily. April.

Nearest to *H. clathroides,* from which it differs in the texture of the peridium and the size of the spores. Calcium oxalate crystals are often found in the peridium and gleba. *H. siculum* differs from *H. Fischeri* in the duplex peridium and size of spores.

6. Hysterangium Thaxteri Zeller & Dodge, sp. nov.

Pl. 2, fig. 5; pl. 3, fig. 28.

Fructificationes ad 1.5 cm. servatae, "russet" vel "Mars brown" (Ridgway); funiculi tenues, copiosi, liberi, concolores; peridium crassum, 2000–3300 μ crassitudine, duplex, strato extero 140–200 μ, hyphis dense compactum, 4–5 μ diametro, strato intero 1860–3160 μ crassitudine, hyphis laxe implexis, 2–4 μ diametro; gleba "argus-brown" (Ridgway); columella recta, 1 mm. crassitudine, cylindrica, non ramosa, in medio gelatinosa; septa 40–45 μ crassitudine, hyphis nodosis, 2–3 μ diametro, laxe implexis; basidia oblongo-clavata, 4–6-spora, 1.5–2 × 7–9 μ, sterig-

matibus brevibus, tenuibus; sporae brunneae acervatae, singulae, hyalinae, ellipsoideae, 3–4 × 1.5–2 μ.

Type: in Thaxter Herb.

Fructifications shrinking to 1.5 cm. in alcohol and glycerine, russet to Mars brown; fibrils slender, abundant, free, concolorous; peridium 2–3.3 mm. thick, duplex, the outer layer 140–200 μ thick, of thick-walled, hyaline, densely woven hyphae 4–5 μ in diameter, inner layer 1860–3160 μ thick, composed of loosely woven, thin-walled hyphae 2–4 μ in diameter, with clamp connections, imbedded in a gel; gleba argus brown; columella straight, 1 mm. thick, cylindric, unbranched, gelatinous in the central third of its diameter; septa 40–45 μ thick, composed of loosely woven, nodose, thin-walled hyphae 2–3 μ in diameter, imbedded in a gel; basidia oblong-clavate, 4–6-spored, 1.5–2 × 7–9 μ; sterigmata short, very fine, about 1 μ long; spores smooth, nearly hyaline singly, but brown in mass, 3–4 × 1.5–2 μ, ellipsoidal.

Brazil and Argentina.

Hysterangium Thaxteri is characterized by its very thick peridium and the nodose hyphae of inner peridium and septa.[1]

Specimens examined:

Argentina: Buenos Aires, *R. Thaxter*, type (in Thaxter Herb.).

Brazil: Rio Grande do Sul, Parecy Novo on Rio Cahy, *J. Rick, 145* (in Farlow Herb.).

7. **Hysterangium pumilum** Rodway, sp. nov.

Pl. 1, fig. 3; pl. 3, fig. 25.

Hysterangium pumilum Rodway, Roy. Soc. Tasmania Papers & Proc. **1917**: 109. 1918; **1923**: 155. 1924 (English description only).

Fructificationes sphericae, 0.2–0.25 cm. diametro metientes, laeves albidae siccatae; funiculi nulli; columella non prominens; peridium tenue, 30–50 μ crassitudine, simplex, tenuibus brunneis hyphis 2–3 μ diametro contextum; gleba "old gold" vel "Saccardo's olive" (Ridgway); locelli angulares, sporis impletis; septa tenua, 25–60 μ crassitudine, hyphis laxe implexis, 6–7 μ diametro metientibus, non gelatinosa; basidia subclavata, curvata, 35–40 × 10–13 μ, sterigmatibus tenuibus; sporae hyalinae, 14–15 × 4–5 μ, fusiformes, finibus perobtusis.

[1] *Rick, 145*, from Brazil, has been attacked by *Penicillium* sp. and the fructifications disorganized beyond recognition but the texture and color of the peridium and the small spores indicate this species.

Type: in Rodway Herb., cotype in Dodge Herb. and Zeller Herb.

Fructifications spherical, 0.2–0.25 cm. in diameter, smooth, white when dry; fibrils none; columella not prominent; peridium 30–50 μ thick, simplex, composed of slender, thick-walled, brown hyphae 2–3 μ in diameter; gleba old gold to Saccardo's olive; cavities polyhedral, filled with spores; septa 25–60 μ thick, composed of loosely woven, thin-walled hyphae 6–7 μ in diameter, much collapsed and disintegrating in cotype material but not gelatinizing; basidia 35–40 × 10–13 μ, subclavate to curved from procumbent position; sterigmata short; spores hyaline, 14–15 × 4–5 μ, fusiform with very obtuse ends.

In heathy soil. Tasman's Peninsula.

In some of the material the spores have begun to germinate, and in some instances seem to be conjugating in pairs.

Specimens examined:

Tasmania: Wedge Bay, *L. Rodway, 1268*, cotype, *1121* (in Rodway Herb., Dodge Herb. 357, Zeller Herb. 7229, and Lloyd Mus. 082).

8. **Hysterangium Thwaitesii** Berkeley & Broome, Ann. & Mag. Nat. Hist. II. **2**: 267. 1848; Tulasne, Fung. Hypog. 82–83. 1851; Berkeley, Outl. Brit. Fungol. 294. 1860; Cooke, Handb. Brit. Fung. **1**: 358. 1870; DeToni in Sacc. Syll. Fung. **7**: 156. 1888; Hesse, Hypog. Deutschl. **1**: 105. 1891. Pl. 3, fig. 18.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 20, 46;* Massee, Ann. Bot. **4**: *pl. 4, f. 80* [Monogr. Brit. Gast. *pl. 4, f. 80*].

Type: in Berkeley Herb. at Kew.

Fructifications 2 cm. in diameter when dry, spherical to somewhat irregular, white, rufous when bruised, drying wood-brown; mycelium white, fibrillose; columella thin, dendroid; fibrils small, nearly free, lighter-colored on the under side of the fructification; peridium 160–180 μ thick, composed of branched, hyaline, gelatinized hyphae 3.5 μ in diameter, underlaid with a sterile portion of the gleba which is composed of thin-walled, parallel hyphae forming a gel as in the septa; gleba Saccardo's olive; cavities long and narrow, filled with spores; septa of thin-walled, parallel

hyphae forming a gel, 90–100 μ thick, basidia not seen; spores rhomboidal, yellowish brown, 17–21 × 6–8 μ.

England.

Specimens examined:

England: near Bristol, *C. E. Broome*, Nov. 1848 (Curtis Herb. at Farlow Herb.); [Leigh Wood, *C. E. Broome*, Aug.] type (in Patouillard Herb. ex Herb. Tulasne at Farlow Herb.).

9. **Hysterangium Rickeni** Soehner, Pilz- und Kräuterfreund **4:** 190–192. 1921; Kryptog. Forsch. **1:** 393. 1924.

Type: in Soehner Herb. but not seen. Authentic material from Soehner in Dodge Herb. and Zeller Herb.

Fructifications spherical, up to 1 cm. in diameter, white to slightly yellowish with a dull reddish tone, finally dirty gray with a violet-brown undertone, drying 0.6 cm., furrowed to scrobiculate, avellaneous; peridium thin, 175–220 μ thick, coriaceous, not easily separable, composed of slender, compact, periclinal hyphae; columella well developed, bluish; gleba at first white with a greenish tone, olive-green when mature, becoming dark green, drying citrine drab; cavities variable in shape; basidia clavate to cylindrical, 2-spored, slender, 28–35 × 4–7 μ; paraphyses smaller but up to 10 μ broad; spores hyaline, yellow to olive-green in mass, 15–18 × 6–7 μ, occasionally less than 15 μ or up to 20 μ, 1–3-guttulate.

Under *Fagus*. Central Europe. June to August.

The above description is based on Soehner's forma *fagorum* which was first and more fully described.

Forma **pinetorum** Soehner, Pilz- und Kräuterfreund **4:** 191. 1921.

This form in pine woods is distinguished by a brighter gray-green, more fragile gleba, more yellowish columella, and non-guttulate spores.

Under *Pinus*. Bavaria. September to November.

The specimen from Salzburg, cited below, was collected in pine woods.

Specimens examined:

Austria: Salzburg, *E. Soehner, 1045* (in Soehner Herb. and Dodge Herb.).

Germany: Bavaria, Pöpplinger Heide bei München, *E. Soehner, 1014* (in Soehner Herb. and Dodge Herb.).

10. Hysterangium fragile Vittadini, Monogr. Tuberac. 14. 1831; Tulasne, Fung. Hypog. 84. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2, I. 1: 879. 1883; DeToni in Saccardo, Syll. Fung. 7: 156–157. 1888; Hollós, Magyarorszag Földalatti Gombai, 88–89. 1911; ? Hesse, Hypog. Deutschl. 1: 103–104. 1891; Soehner, Krypt. Forsch. 1: 392. 1924.

Illustrations: Vittadini, Monogr. Tuberac. *pl. 4, f. 15;* ? Hesse, Hypog. Deutschl. 1: *pl. 7, f. 22.*

Type: location unknown to us.

"Fructifications subglobose, without fibrils ? ; peridium thick, very fragile, yellow without, bare, granulose, farinose; gleba very soft, ashy, becoming greenish; cavities irregular, scarcely visible; odor, when fresh, that of *Tuber Borchii;* about the size of a filbert; peridium soft, thick, white within, reminiscent of the cortex of the stipe of *Verpa digitaliformis*, easily separating from the gleba. A gelatinous layer attaching the peridium to the gleba is very thick, hence the mature gleba is very soft and subdeliquescent. When mature and freshly dug, the peridium cracks off as easily as the shell of a sparrow's egg.

"In oak woods near the Po River, under fallen leaves, half buried; winter. It has been found by me twice. This species has the surface color of *H. clathroides*, the softness of the flesh of *H. membranaceum;* it differs from both in the nature of the peridium, odor, habitat and season."—Vittadini.

Hesse, who reports finding this species twice on Dammelsberg near Marburg, gives the following characters: peridium 1.5 mm. thick, composed of richly septate and branched hyphae; cavities small; septa broad; basidia cylindrical, 2–3-spored; spores slightly appendiculate, 12 × 4 μ, gray-green in mass. Soehner reports several collections agreeing with Hesse's description, spores 10–12.5 × 3–4 μ. Hollós reports several collections from Hungary agreeing with Hesse, giving spores 12–16 × 4–5 μ. This material seems to belong to a distinct species but we prefer not to name it until more material is available.

Hollós, after studying a fragment of the type, states that the

spores are 22–24 × 7–8 μ, peridium red-spotted, drying very thin, and regards *H. fragile* Vitt. as a possible synonym of *H. stoloniferum* Tul. Tulasne reports the spores 23 × 6.4 μ, practically obliterating the cavities.

11. Hysterangium calcareum Hesse, Hypog. Deutschl. **1**: 97. 1891; Saccardo, Syll. Fung. **11**: 168. 1895. Pl. 3, fig. 15.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 21, 23; pl. 9, f. 15.*

Type: probably in Bot. Inst. Univ. Marburg; not seen, although other material determined by Hesse was studied.

Fructifications globose, the size of a hazel-nut, grayish white; columella branched, penetrating to the middle of the fructification; peridium fleshy when young, becoming fragile and papery, 0.6 mm. thick, composed of an outer layer of grayish white, thin-walled hyphae, a layer of brownish yellow hyphae, a layer of coarse, loosely woven, septate, hyaline hyphae, and another very thin layer of slender brownish yellow, periclinal hyphae; gleba bluish to olive-green; cavities narrow, much longer than broad, at first empty, later filled with spores; septa thinner than in *H. rubricatum*, cartilaginous; basidia cylindric, 2-spored; spores broad-ellipsoidal, 11–13 × 4–5 μ, hyaline, gray-green in mass, appendiculate, epispore thin at first, thickening with age.

In calcareous soil in birch woods. Germany and Czechoslovakia. Summer.

This species differs from *H. clathroides* in structure of the peridium, form and size of the spores, and the longer cavities, and from *H. rubricatum* in lack of a reddish color in the peridium.

Specimens examined:

Czechoslovakia: Mähren, Zwittau, *J. Hruby* (in Hesse Herb. at Bot. Inst. Univ. Marburg).

12. Hysterangium Petri Mattirolo, Malpighia **14**: 262–263. 1900; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 247. 1902.

Type: location unknown to us.

Fructifications globose, white, lightly spotted with yellow, unchanging, varying in size from that of a pea to that of a filbert; columella central, gelatinous, little developed; peridium easily

separable, fibrous, composed of thick-walled hyphae; gleba grayish virescent; cavities minute-elongate; basidia 2-spored, cylindrical; spores ovate-elongate, smooth, hyaline, 11–14 × 4–5 μ; odor weak.

In chestnut groves. Italy. April.

This species is nearest *H. Thwaitesii*, from which it differs by the yellow color of the peridium, which remains unaltered in alcohol or on drying, and in the size of the spore.

DOUBTFUL SPECIES

1. **Hysterangium viscidum** Massee & Rodway, Kew Bull. Misc. Inf. **1898**: 127. 1898; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 246. 1902; Rodway, Roy. Soc. Tasmania Papers & Proc. **1911**: 27–28. 1912; **1923**: 155. 1924.

Illustrations: Rodway, Roy. Soc. Tasmania Papers & Proc. **1911**: *pl. 3, f. 8.*

Type: not seen.

"Fructifications irregular, oblong, chestnut-color, viscid, 3 × 1.5 cm.; peridium thick, tough, easily separable from the gleba; gleba pale at first, dark brown in age; cavities radiating from the base, small, irregular; septa thick, brown, not scissile; basidia 3–4-spored; spores broadly oblong-ellipsoidal, obtuse at both ends, 12–15 × 8–10 μ, minutely papillate, yellowish brown to dirty brown in mass.

"In gullies near Hobart, *L. Rodway, 270.*

"Readily distinguished in the genus by the chocolate brown, viscid peridium and elliptic oblong, obtuse spores."—Massee & Rodway.

It seems quite probable that this species belongs in the genus *Hymenogaster*, and in the group of species of that genus with viscid peridia, for nearly all the characters given in the meagre description are very unusual in the genus *Hysterangium*. However, since we have not seen the type nor any material surely referable there, we prefer to leave this among the doubtful species.

Cleland's collection, No. 16, National Park, S. Australia, agrees with the above description in all respects. It is also referable to *Hymenogaster nanus* Massee & Rodway, 1899.

2. **Hysterangium fusisporum** Massee & Rodway, Kew Bull. Misc. Inf. **1898**: 127. 1898; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 247. 1902; Rodway, Roy. Soc. Tasmania Papers & Proc. **1911**: 26. 1912; **1923**: 155. 1924.

Type: probably at Kew Herb. but not seen.

Subglobose, irregular, 1.5–2 cm. in diameter, smooth, very thin, white to yellow-spotted, hyaline within; peridium not separable; gleba firm, pale; cavities small, irregular, sinuous; spores fusiform, smooth, 20–22 × 8 μ, hyaline; basidia 2-spored; sterigmata short.

Habitat, subterranean, Tasmania (*Rodway*).

While we have not seen the type, material sent us by Rodway should be referred to *Hymenogaster*. Further consideration of these species may be deferred until we have seen the type.

EXCLUDED SPECIES

1. **Rhizopogon Marchii** (Bresadola) Zeller and Dodge, comb. nov.

Hysterangium Marchii Bresadola, Fung. Trident. **2**: 99. 1900; Saccardo & P. Sydow in Sacc. Syll. Fung. **16**: 246. 1902; Bataille, Soc. Myc. France Bull. **39**: 166. 1923.

Illustrations: Bresadola, Fung. Trident. **2**: *pl. 211, f. ii.*

Type: portion of type in Dodge Herb.

Fructifications irregularly depressed-globose, 2–3.5 × 1–2 cm., color Natal brown when moist, drying avellaneous to wood-brown (Isabella color in Bresadola's plate); rooting fibrils few, large; columella branching almost at the base of the fructifications, slender, inconspicuous; peridium 180–230 μ thick, stupose, composed of granulose, large, thin-walled, yellow-brown hyphae 5–8 μ in diameter, loosely woven toward the outside, slightly smaller and more compactly woven within; gleba buffy citrine, cavities very small, irregular, filled with spores; septa 140–160 μ, composed of slender, thin-walled hyphae 3–5 μ in diameter, becoming highly gelatinized at maturity; spores acrogenous, old gold, ellipsoidal, often truncate at the base, 8–11 × 4–5.5 μ, smooth. No odor.

Under *Pinus nigra* near Trieste. September.

Specimens examined:

Italy: Trieste, Verla, *I. Marchi*, type (in Bresadola Herb. and in Dodge Herb.).

2. **Rhizopogon niger** (Lloyd) Zeller & Dodge, comb. nov.

Hysterangium niger Lloyd, Myc. Notes 68: 1173. 1923, nom. nud.; Verwoerd, S. African Jour. Sci. **22**: 163. 1925.

Illustrations: Lloyd, Myc. Notes 68: *f. 2325.*

Fructificationes depresso-sphaeroideae, subirregulares, 3 × 1 × 1.5 cm. diametro metientes, nigrae; peridium tenue, 75–100 μ crassitudine, stuppeum, hyphis nigro-brunneis, 2–3 μ diametro, subparallelibus contextum; gleba "Brussels brown" (Ridgway); locelli parvi, angulares, vacui; septa circa 40–50 μ crassitudine, gelatinosa, cellulis ellipsoideis vel sphericis, facile tinguentibus impletis, strato medio cellulis elongatis facile tinguentibus; basidia filiformia, trispora; sporae brunneae acervatae, ellipsoideae, 7–9 × 2–3 μ.

Type: in Lloyd Museum, in Dodge Herb., and in Zeller Herb.

Fructifications depressed-spheroidal to somewhat irregular, perhaps due to the coalescence of several fructifications, drying 3 × 1 × 1.5 cm., black without, covered with adhering sand grains; peridium 75–100 μ thick, stupose, composed of dark brown, thick-walled, nearly parallel hyphae 2–3 μ in diameter; gleba Brussels brown; cavities small, angular, empty; septa about 40–50 μ thick, highly gelatinized, traversed through the middle by a layer of deeply staining, closely woven hyphae, the remainder of the gelatin filled with irregularly placed, ellipsoidal to spherical, deeply-staining cells, which seem to have no visible connection either with the central strand or with each other; basidia narrow, filiform, crowding out between the superficial, gelatinized cells of the septa, mostly 3-spored; spores brown in mass, slender, ellipsoidal, 7–9 × 2–3 μ.

South Africa.

Superficially this species looks like *Rhizopogon piceus;* the color and texture of the gleba is much as in *R. pachyphloeus*, but micsoscopically it is easily distinguishable from either.

Specimens examined:

South Africa: Knysna, *Miss A. V. Duthie*, type (in Lloyd Mus. 081, in Dodge Herb. 353, and in Zeller Herb. 7246).

3. **Hysterangium ? Pseudo-Acaciae** (Fries) DeToni in Sacc. Syll. Fung. **7**: 159. 1888.

Explanation of Plate

PLATE 1

Fig. 1. *Hysterangium album* Zeller & Dodge.
Section of peridium and gleba showing their structure and relation to each other. From type material. × 42.5.

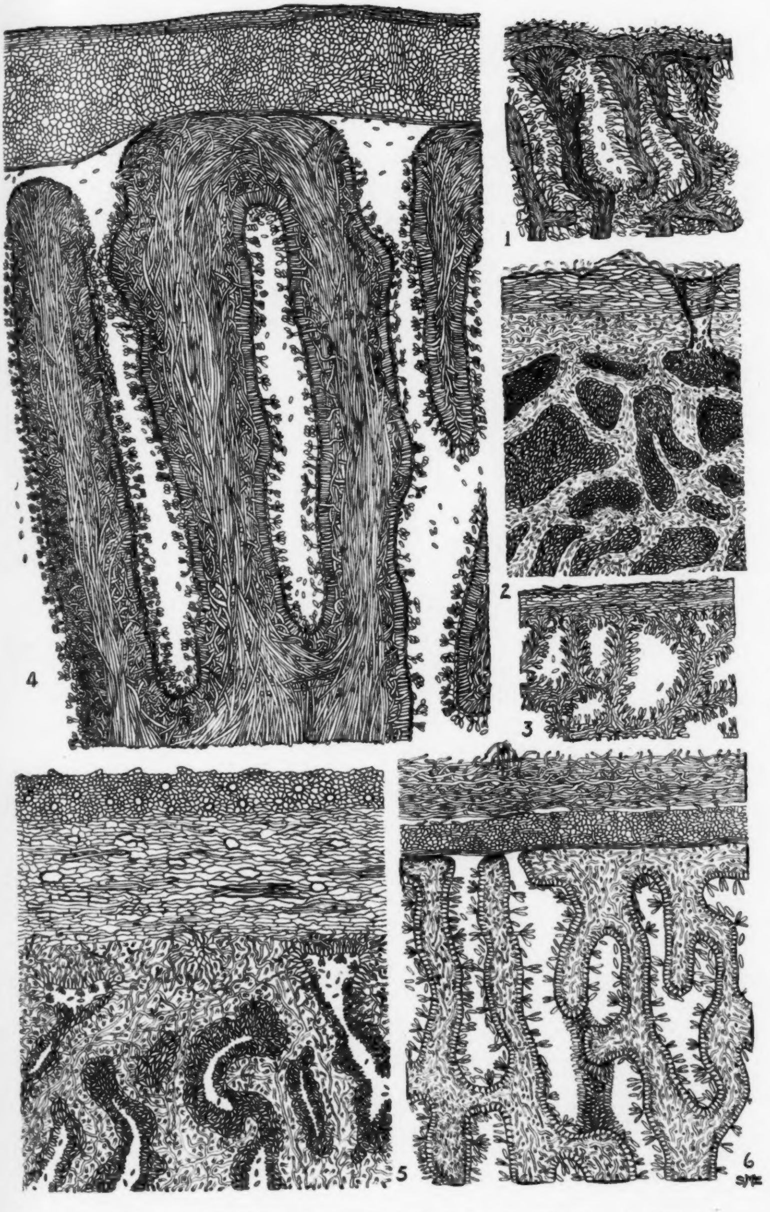
Fig. 2. *Hysterangium Fischeri* Zeller & Dodge.
Section showing structure of peridium and gleba and their relation. The peculiar pores extending from glebal cavities to the surface of the fructifications were not infrequently found in the type material, but may not be a constant character. × 42.5.

Fig. 3. *Hysterangium pumilum* Rodway.
Section showing the relation of the peridium to the gleba, the simple structure of the septa, and the pseudoparenchyma of the peridium. Drawing made from cotype material. × 42.5.

Fig. 4. *Hysterangium crassirhachis* Zeller & Dodge.
Section showing the parenchyma of the easily-separable peridium and the structure of the very broad, radiating septa. Drawing made from type material. × 42.5.

Fig. 5. *Hysterangium purpureum* Zeller & Dodge.
Section of the peridium and gleba showing their close relation to each other, the two types of parenchyma of the peridium, both of which are penetrated periclinally by lacunae. The septa are gelatinous. Drawing from type material. × 42.5.

Fig. 6. *Hysterangium strobilus* Zeller & Dodge.
Section showing the outer, fibrous layer which is more readily separable from the inner, parenchymatous layer of the peridium than is the latter from the gleba. Drawing from type material. × 42.5.



ZELLER AND DODGE—HYSTERANGIUM IN NORTH AMERICA

EXPLANATION OF PLATE

PLATE 2

Fig. 1. *Hysterangium affine* Massee & Rodway.

Section showing parenchyma of the peridium and the relation of the latter to the gleba. Drawing from Rodway's Tasmanian collection No. 1261. × 42.5.

Fig. 2. *Hysterangium cistophilum* (Tulasne) Zeller & Dodge.

Section showing the fibrous structure of the peridium and the layer of glebal tissue beneath it. Drawing from Zeller's Oregon collection No. 7197. × 42.5.

Fig. 3. *Hysterangium clathroides* Vittadini.

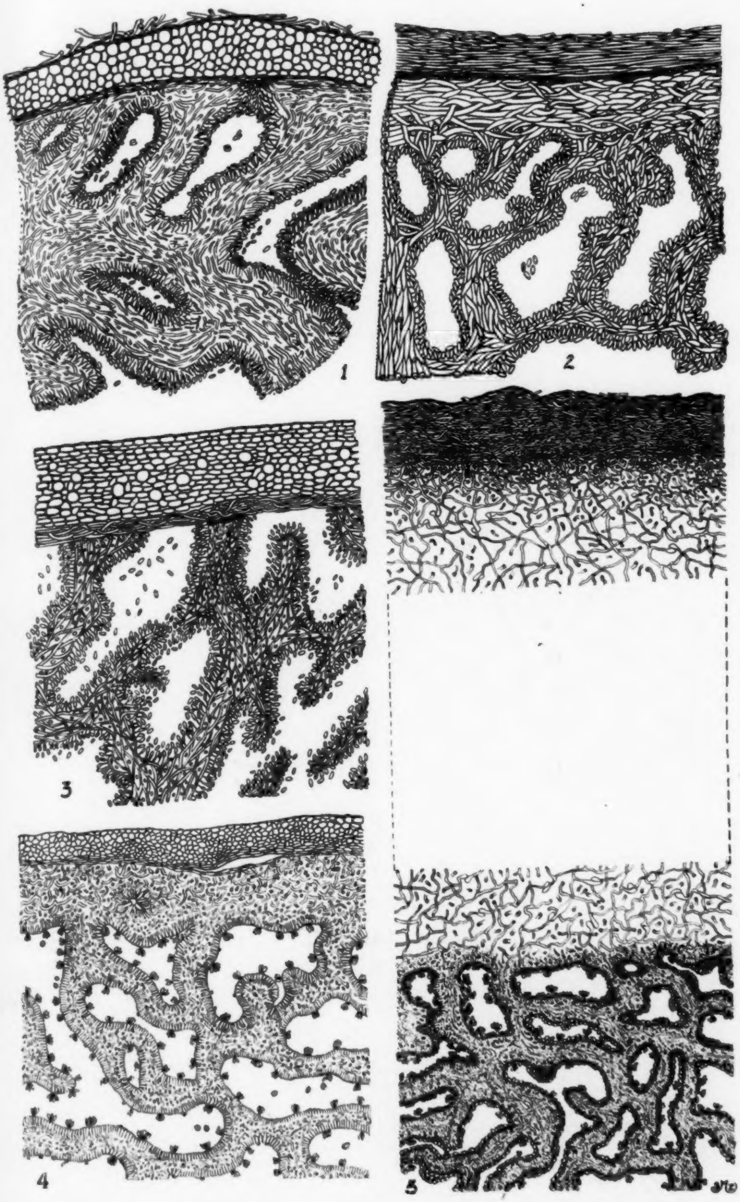
Section of peridium and gleba showing the separable character of the peridium along the inner side of a thin fibrous layer beneath the major parenchymatous portion. Drawing from Zeller's Oregon collection No. 2582. × 42.5.

Fig. 4. *Hysterangium inflatum* Rodway.

Section showing the rather thin parenchymatous peridium, the very thin film of pseudoparenchyma between it and the gleba, and the thick, underlying, sterile, glebal layer. The peridium separates from the gleba along the line of pseudoparenchyma. Drawing from Rodway's Tasmanian collection No. 1267, which is labeled "cotype." × 42.5.

Fig. 5. *Hysterangium Thaxteri* Zeller & Dodge.

Section of the peridium and gleba showing the very thick gelatinous layer of peridium and the thinner fibrous outer layer (rind). The hyphae of the gelatinous layer are suspended in a hyaline gel. Note the peculiar clamp-connections of the inner peridial layer and tramal tissues of the septa. Drawing from Dr. Thaxter's Argentine type collection. × 42.5.



ZELLER AND DODGE—HYSTERANGIUM IN NORTH AMERICA

EXPLANATION OF PLATE

PLATE 3

Fig. 1. *Hysterangium occidentale* Harkness.

Section of the peridium and gleba showing their relation and structure. The outer peridial layer of loosely interwoven hyphae overlies a layer which is a peculiar mixture of parenchyma and pseudoparenchyma. A thin fibrous layer separates peridium and gleba. The septa and main percurrent branches of the columella are thick and of a gelatinous structure. Drawing from Oregon material (Zeller, 7063). × 42.5.

Fig. 2. *Hysterangium neglectum* Massee & Rodway.

Section showing structure of the peridium and gleba, and section of one percurrent branch of the columella. The peridium is composed of two distinct layers of pseudoparenchyma. Drawing from Tasmanian material (Rodway, 614, cotype). × 42.5.

Fig. 3. *Hysterangium obtusum* Rodway.

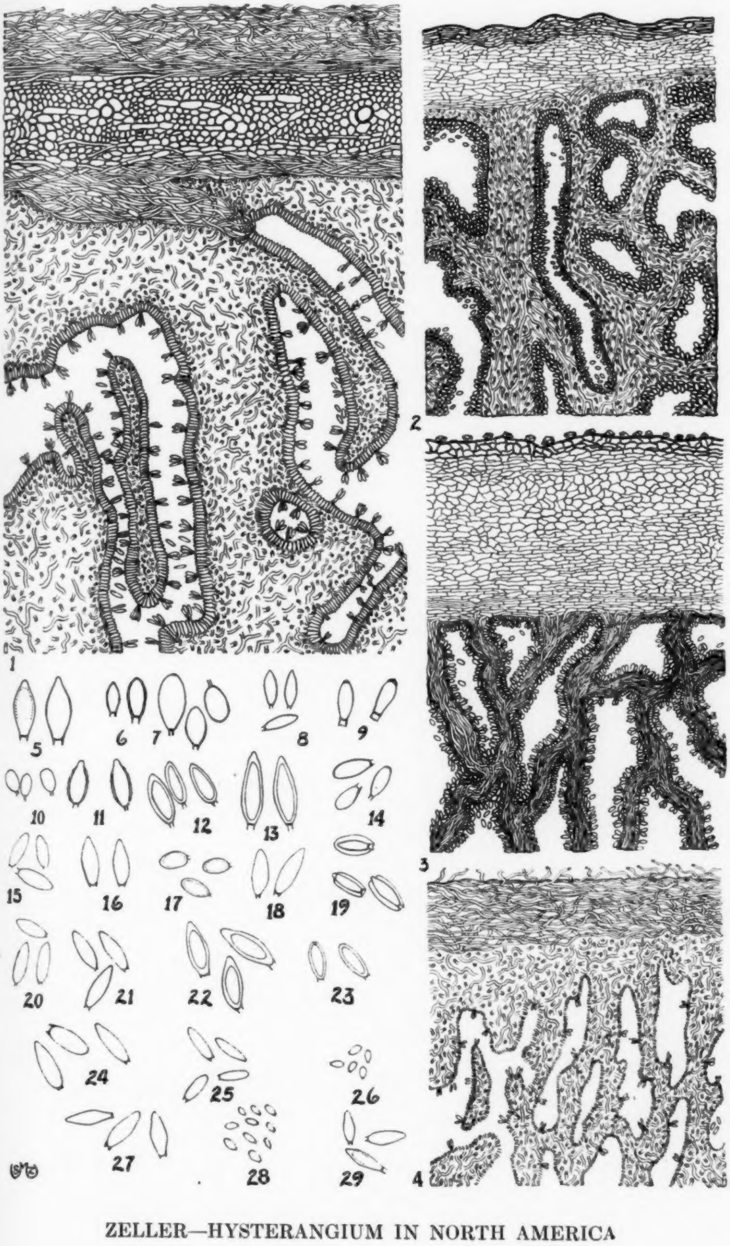
Section of the thick peridium of spongy pseudoparenchyma which is mixed with some parenchyma but as a whole not in definite layers. The outer rind is almost distinct because of color and heavy cell walls. The septa of the gleba are fibrous in structure. Drawing from Tasmanian material (Rodway, 1264, cotype). × 42.5.

Fig. 4. *Hysterangium fuscum* Harkness.

Section showing the fibrous structure of the peridium and its relation to the underlying layer of sterile glebal tissue. Drawing from Parks' Californian collection, No. 1167. × 42.5.

Figs. 5–29. Outline drawings to show relative size and form of various species of *Hysterangium*. All, × 500.

Fig. 5. Spores of *H. album* Zeller & Dodge.
Fig. 6. Spores of *H. affine* Massee & Rodway.
Fig. 7. Spores of *H. neglectum* Massee & Rodway.
Fig. 8. Spores of *H. Fischeri* Zeller & Dodge.
Fig. 9. Spores of *H. occidentale* Harkness.
Fig. 10. Spores of *H. obtusum* Rodway.
Fig. 11. Spores of *H. strobilus* Zeller & Dodge.
Fig. 12. Spores of *H. clathroides* Vittadini.
Fig. 13. Spores of *H. stoloniferum* Tulasne.
Fig. 14. Spores of *H. fuscum* Harkness.
Fig. 15. Spores of *H. calcareum* Hesse.
Fig. 16. Spores of *H. nephriticum* Berkeley.
Fig. 17. Spores of *H. membranaceum* Vittadini.
Fig. 18. Spores of *H. Thwaitesii* Berkeley & Broome.
Fig. 19. Spores of *H. inflatum* Rodway.
Fig. 20. Spores of *H. crassirhachis* Zeller & Dodge.
Fig. 21. Spores of *H. purpureum* Zeller & Dodge.
Fig. 22. Spores of *H. cistophilum* (Tulasne) Zeller & Dodge.
Fig. 23. Spores of *H. Pompholyx* Tulasne.
Fig. 24. Spores of *H. Harknessii* Zeller & Dodge.
Fig. 25. Spores of *H. pumilum* Rodway.
Fig. 26. Spores of *H. Phillipsii* Harkness.
Fig. 27. Spores of *H. rubricatum* Hesse.
Fig. 28. Spores of *H. Thaxteri* Zeller & Dodge.
Fig. 29. Spores of *H. neocaledonicum* Patouillard.



ZELLER—HYSTERANGIUM IN NORTH AMERICA